

Congenital Musculoskeletal Lesions and Hyperplastic Goitre in Foals

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SUMMARY

Seven foals with multiple congenital musculoskeletal abnormalities are described. Rupture of common digital extensor tendons, forelimb contracture, and mandibular prognathism were common findings. Severe hyperplastic goitre was consistently present.

RÉSUMÉ

Lésions musculo-squelettiques congénitales et goitre hyperplasique, chez des poulains

Cet article décrit des anomalies congénitales musculo-squelettiques qui affectaient sept poulains. La rupture du tendon extenseur digital commun, des contractures aux membres antérieurs et du prognathisme mandibulaire, s'avèrent fréquents. Tous ces poulains souffraient aussi de goitre hyperplasique.

INTRODUCTION

Congenital contracture deformities of the equine forelimbs have been reported by several authors (4,7,8,9). Rupture of the common digital extensor tendons, and occasionally of other extensor tendons, have been noted with and without forelimb contractures (3,7,8,9,11). Other musculoskeletal abnormalities which have coexisted with forelimb contractures include scoliosis, torticollis, incomplete closure of the abdominal wall and mandibular prognathism (7,8,9).

Although the congenital nature of these lesions has been well documented (4,7,8,9,11), the etiology and pathogenesis are less well understood. Hereditary influences, drugs, viruses and nonhereditary defects of embryonic mesenchyme and cartilage have been suggested to play a role in the evolution of these lesions (7,8). Fore-

limb contractures have been reported in foals whose dams ingested excessive amounts of inorganic iodide (1). This report describes the historical and pathological findings in seven foals which had multiple congenital musculoskeletal abnormalities and hyperplastic goitre.

MATERIALS AND METHODS

Seven foals were admitted to the Western College of Veterinary Medicine between May and August 1980, with multiple musculoskeletal abnormalities. A clinical examination was performed, and the foals euthanized with an intravenous barbiturate solution. A complete necropsy was performed, and selected tissues fixed in 10% neutral buffered formalin, embedded in paraffin, sectioned at six microns and stained with hematoxylin-eosin. Bone specimens were decalcified in 20% formic acid and processed as above.

History and Clinical Findings

The age at necropsy, breed and sex of the seven foals are presented in Table I. The foals were weak at birth and could not rise or suckle unaided. Obvious musculoskeletal abnormalities included rupture of common digital extensor tendons, forelimb contractures, mandibular prognathism and scoliosis. In all cases the lesions were present at birth. Treatment of the limb deformities by bandaging was attempted in one case but was unsuccessful. Dams of the affected foals appeared clinically normal, as did all other mares and foals on the same premises. Two dams of affected foals had had a previous foal with "crooked legs" or "weak joints". Both became normal by several months of age.

Neither was examined by a veterinarian.

The type and quality of feed provided to the mares was unremarkable. In each case a red or blue salt block was available, but it was not certain that the salt blocks had been used by these mares.

Gross Findings

The gross findings are summarized in Table I. In all foals, a rounded five to ten centimeter diameter, fluctuant swelling was present on the distal craniolateral aspect of the carpus. The subcutaneous tissues here were edematous, and had widespread ecchymotic hemorrhages. Incision of the swelling revealed rupture of the common digital extensor tendon. The distal portion of the tendon was folded upon itself and surrounded by copious serosanguinous fluid, causing distention of the tendon sheath (Figure 1). That portion of the tendon adjacent to the defect was dark blue and appeared necrotic. The mesotendon was swollen, edematous and had ecchymotic hemorrhages. In some cases the rupture was incomplete, with ragged strands of tendon connecting the prox-

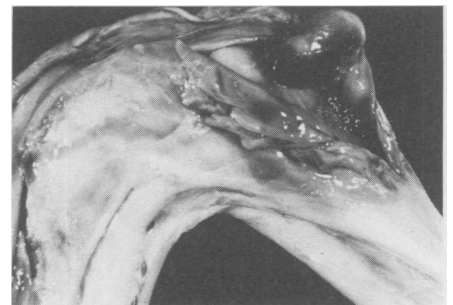


FIGURE 1. Contracted forelimb of newborn foal, with tendon sheath opened to expose folded, necrotic end of ruptured common digital extensor tendon.

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imal and distal portions. The rupture invariably occurred in the area of the musculotendinous junction. Diffuse hemorrhages extended for a variable distance into the muscle belly itself.

Bilateral forelimb contractures were present in five foals. These varied from mild to severe, and involved the carpal, and to a lesser extent, the metacarpophalangeal joints. Segmental severance of the superficial and deep digital flexor tendons and the suspensory ligament produced only slight straightening of the limb. Incision of the palmar aspect of the carpal joint capsule allowed normal limb extension.

One foal also had ruptured extensor carpi radialis tendons, however, this case was complicated by ischemic necrosis of the forelimbs caused by an excessively tight bandage.

Contractures of the metatarsophalangeal joints were present in three cases. Neither bony nor soft tissue abnormalities were evident.

Mandibular prognathism was present in four foals (Figure 2). One foal had a high, domed cranium, mild



FIGURE 2. Midsagittal section of the head of a newborn foal with mandibular prognathism.

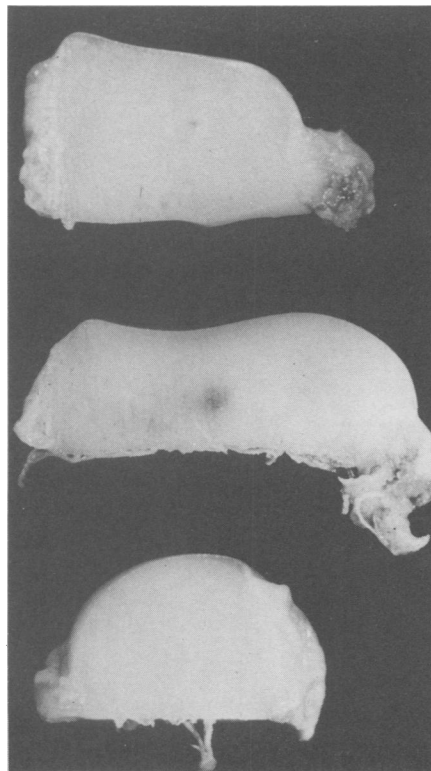


FIGURE 3a. Cross section of the second, third and fourth carpal bones of a foal. Ossification has been retarded and the bones are almost entirely cartilaginous.

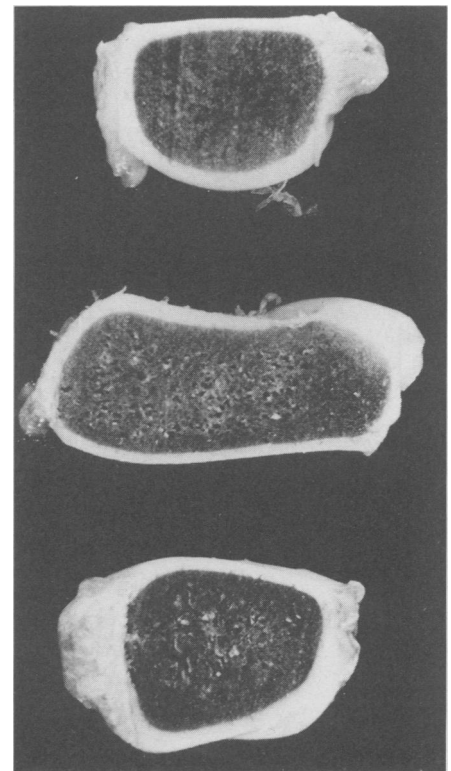


FIGURE 3b. Cross section of the second, third and fourth carpal bones of a normal foal of the same age.

hydrocephalus and severe scoliosis of the thoracic spine. All foals had severely retarded ossification of carpal and tarsal bones, which were composed almost entirely of cartilage (Figure 3). The ossified nucleus of each bone was represented only by minute bony spicules.

The thyroid glands were normal or slightly increased in size and firm in consistency.

Histological Findings

Widespread, ecchymotic hemorrhages were present in the ruptured common digital extensor tendons. The hemorrhage was most severe adjacent to the necrotic, ruptured tendon edge and beneath the surface of the tendon. The mesotendon was swollen, edematous and hemorrhagic. Hemosiderin-bearing macrophages were occasionally present, usually in the mesotendon

TABLE I
HISTORY AND NECROPSY FINDINGS IN SEVEN FOALS WITH MUSCULOSKELETAL AND THYROIDAL ABNORMALITIES

Foal #	Breed	Age at Necropsy	Sex	Ruptured Common Digital Extensors	Forelimb Contracture	Mandibular Prognathism	Immature Carpal and Tarsal Bones	Hyperplastic Goitre
1	QH ^a	7 days	M	+	+	-	+	+
2	QH	2 days	M	+	+	-	+	+
3	QH	1 day	F	+	+	-	+	+
4	TB ^b	1 day	M	+	+	+	+	+
5	Arab-cross	1 day	F	+	+	+	+	+
6	QH	1 day	M	+	-	+	+	+
7	QH	21 days	F	+	-	+	+	+

^aQuarterhorse

^bThoroughbred

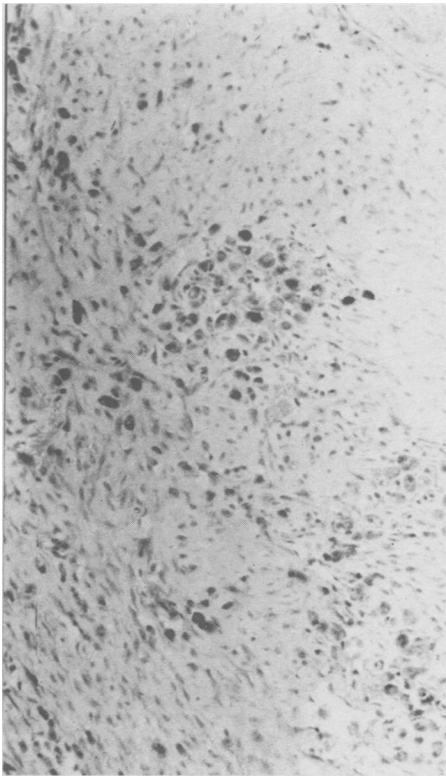


FIGURE 4. Granulation tissue and hemosiderin-laden cells adjacent to the ruptured end of a common digital extensor tendon. H & E. X200.

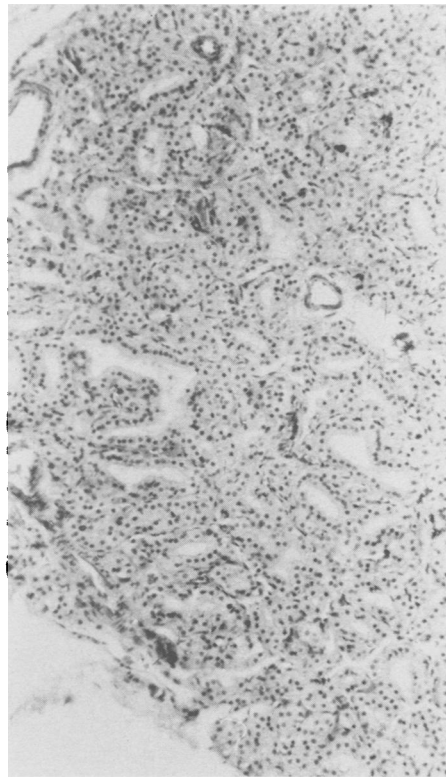


FIGURE 6a. Hyperplastic thyroid gland of a newborn foal. The follicles are small, angular and densely crowded. Almost no colloid is present. H & E. X30.

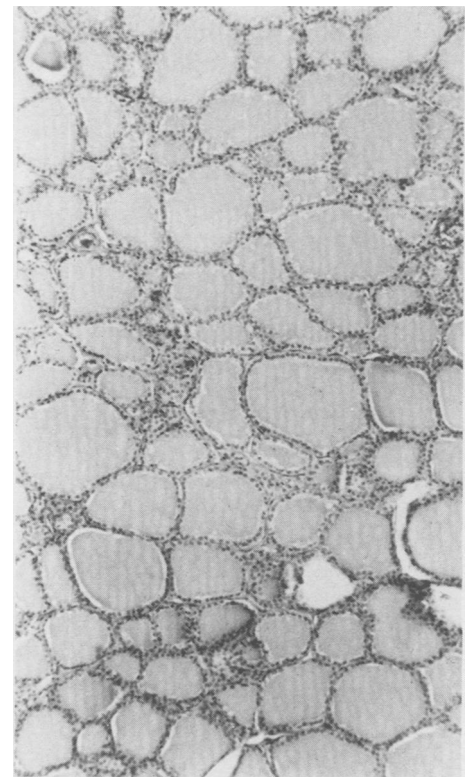


FIGURE 6b. Thyroid gland of a normal newborn foal. The follicles are circular and lined by a regular, cuboidal epithelium. Colloid is clearly evident. H & E. X30.

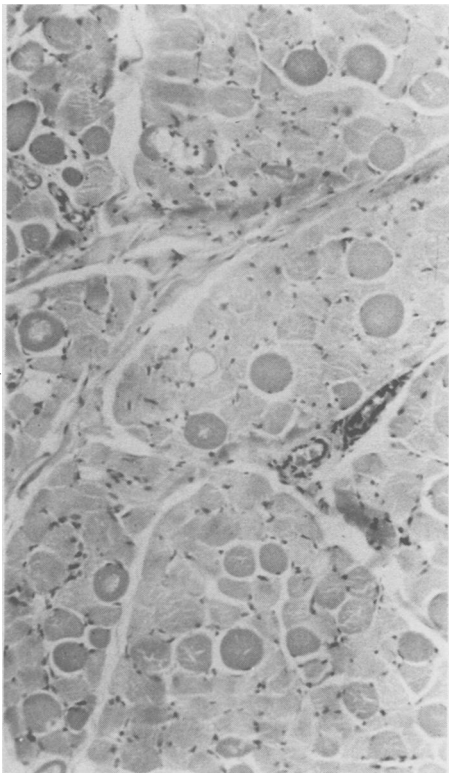


FIGURE 5. Degenerative changes in common digital extensor muscle. Many muscle fibers are swollen, deeply eosinophilic and centrally vacuolated. H & E. X200.

or adjacent to the ruptured end of the tendon (Figure 4). Granulation tissue was present at the site of rupture. The common digital extensor muscles had widespread degenerative changes. Muscle bundles were swollen, glassy and stained deeply eosinophilic (Figure 5). Many fibers were centrally vacuolated, others had fine granular central areas of calcification. Central nuclei were occasionally present.

The thyroid glands in all foals had very small, densely crowded follicles which contained little colloid. The follicular epithelium was tall columnar. Papillary projections of epithelial cells were present in some follicles. These changes contrasted dramatically with the histological appearance of thyroid tissue from normal foals of the same age, which had some variation in follicle size and shape and a regular, cuboidal epithelium (Figure 6a and 6b).

DISCUSSION

Forelimb contractures, rupture of common digital extensor tendons, mandibular prognathism and other musculoskeletal abnormalities have

been reported in various combinations by several authors (4,7,8,9). In one series of foals (8), forelimb contractures were consistently present and always associated with abnormalities of the axial skeleton such as scoliosis and torticollis. Rupture of common digital extensor tendons occurred in few of these cases. The lesions were considered congenital and nonhereditary. Another report describes rupture of common digital extensor tendons apparently without forelimb contractures or other abnormalities (11). Ruptures were rarely present at birth, most appearing at two to three days of age. A recent review of ten cases of ruptured common digital extensor tendons associated this lesion with forelimb contractures in seven cases. Other lesions were mandibular prognathism, ruptured lateral digital extensor tendons, underdeveloped carpal bones, and hindlimb contractures. The male to female ratio was 1:1, and all foals had Quarterhorse or Arabian breeding. In five of the ten cases, the lesions were congenital. The features closely parallel those of the seven cases reported herein (Table I). All had rup-

tured common digital extensor tendons, five had forelimb contractures, four had mandibular prognathism, all had hypoplastic carpal bones, and in addition, all had hyperplastic goitre. The male to female ratio was 4:3. Six of seven foals had Quarterhorse or Arabian breeding. In all cases, the lesions were congenital.

The precise relationships between the lesion of hyperplastic goitre and the other lesions present in these foals are unclear. The thyroid gland plays an important role in bone growth and maturation. Thyroxine is synergistic with somatomedin, a polypeptide which is released from the liver in response to pituitary growth hormone and is responsible for skeletal growth (7). Fetal thyroidectomy of the lamb results in delayed ossification, decreased longitudinal bone growth and failure to resorb primary bone (6). Tarsal bone lesions have been described in foals with hypothyroidism (10). The foals in this report had severely retarded ossification of carpal and tarsal bones which may reflect hypothyroidism. Contracted tendons have also been reported in newborn foals of dams which had been fed goitrogenic diets (1). Mandibular prognathism, which was present in four foals, has been reported in goitrous newborn Angora goats (2).

The etiology of the hyperplastic goitre in these cases is unknown. The iodine content of the mares' diets was not specifically determined, but an iodized salt block was present in each case. Goitrogenic plants were not obviously present in the diet. Other mares from the same premises produced normal healthy foals, which suggests that an environmental influence common to all the horses may not have been present. It has been reported, however, that thyroid hormone levels in the normal newborn foal are many times greater than those of adult horses, and much higher than that of any other species in any physiological state (7). It has been suggested that the horse has been under considerable evolutionary selection pressure for high levels of thyroid hormones at birth. This may create a high degree of sensitivity to any abnormalities of thyroid function in the prenatal or neonatal period.

Although the histological changes may be severe, the thyroid glands of goitrous foals are seldom appreciably enlarged (5), indicating the need for microscopic evaluation.

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