

Involvement of Trauma in the Pathogenesis of Osteochondritis Dissecans in Swine

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ABSTRACT

Limb joint soundness was examined in 40 pigs loaded into a wooden box cart and 40 control pigs not subjected to loading. On postmortem examination, eight loaded pigs showed osteochondritis dissecans in their medial humeral condyles, suggesting that porcine joints are vulnerable to osteochondral lesions when mechanically overloaded. Prevention of trauma by careful handling of pigs during penning and transportation should help to control joint lesions and lameness.

RÉSUMÉ

Cette expérience consistait à vérifier l'intégrité des articulations des membres, chez 40 porcs transportés dans un chariot de bois et chez 40 témoins. La nécropsie de ces porcs révéla que huit des premiers affichaient de l'ostéochondrite disséquante du condyle huméral médial, indice que les articulations des porcs sont sujettes à des lésions ostéo-chondrales, lors de surmenage. La prévention des traumatismes, par une manipulation précautionneuse des porcs, à l'occasion d'un déménagement ou d'un transport, devrait contribuer à réduire les lésions articulaires et les boiteries.

Osteochondritis dissecans is a condition characterized by separation of a segment of joint cartilage (articular-epiphyseal cartilage com-

plex) from the subchondral bone (1). The pathogenesis of the condition is unclear. Involvement of trauma, ischemia and abnormal cartilage growth has been suggested (2). In this experiment, swine limb joints subjected to compression stress, by means of transporting animals in a wooden box cart, were examined for soundness. The observations suggested that trauma is an important cause of osteochondritis dissecans and lameness.

Eighty crossbred (Landrace × Yorkshire) pigs of an average body weight of 29 kg were used. These animals were derived from 20 pens, each having four animals. Forty pigs (ten pens) were assigned to load into a wooden box cart. This is a common practice used to move pigs. No bedding materials were used on the floor of the cart. Two workers, who were not informed of the purpose of the experiment, were involved in loading pigs. Each animal was grasped by its ears and tail, lifted to the top of the cart located beside the pen and transferred into it. Because of their violent activity, it was difficult to hold pigs until their feet reached the floor of the cart. Animals were thus dropped on the floor from varying heights (< 1 m), resulting in compression to joints of pigs. Although not recorded, more animals fell on their front feet. Four pigs from the same pen were loaded at one time to move to a pen in another barn (approximately 50 m). The front side board of the cart, which was attached to the floor with hinges and to the sides with locks, was then

opened to unload pigs across the board with a slope approximately 15° against the floor of the pen. Control animals from each pen were transferred to another pen by walking a similar distance.

All animals were raised under normal nutritional and management conditions (3) until they were euthanized at 90 kg body weight. Evaluation of locomotor ability of pigs and of their joint soundness based on visual and light microscopic observations was performed as described (3).

Locomotor ability was apparently normal in all control animals and 32 animals that were loaded in the cart, while eight loaded pigs had a relatively stiff, stilted gait of their front limbs, which were frequently held slightly laterally with elbows close to the thorax. On postmortem examination, these animals had fracture of joint cartilage (5 to 10 mm in size) on the medial weight bearing surface of the humeral condyle. This was reflected by higher ($p < 0.05$) lesion scores for pigs loaded into the cart than for control animals (Table I). Six pigs had bilateral lesions. Affected cartilage was thickened and partially detached from the subchondral bone (osteochondritis dissecans). Formation of repair tissue comprised of fibrous and cartilaginous tissues was observed microscopically on the subchondral bone. Two pigs with unilateral lesion in the humeral condyle also had unilateral chondro-osseous fracture (approximately 7 mm in size) in the semilunar notch of the proximal ulna. Joint lesions observed in animals

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TABLE I. Average Joint Lesion Scores for Pigs Loaded into the Cart and Control Animals

	Loaded	Control	SE	Significance ^a
No. of animals	40	40		
Proximal ulna	1.75 ^b	1.33	0.22	NS
Distal humerus	2.70	1.58	0.21	P < 0.05
Proximal femur	1.35	1.55	0.16	NS
Distal femur	2.01	2.11	0.28	NS

^aA Student's t-test was used

^bAverage of scores from right and left legs. Scores ranged from 1 (normal) to 6 (severe lesion)

other than the eight affected pigs were mainly associated with mild degrees of disturbed endochondral ossification (osteochondrosis). There was no treatment effect ($p < 0.05$) on lesion scores of the proximal ulna, the proximal femur and the distal femur (Table I).

The present observations suggest possible involvement of compression injury of cartilage and/or subchondral bone in the development of osteochondritis dissecans. Osteochondrosis, which results in focal thickening of the cartilage (4) might have contributed to increased vulnerability of the tissue to fracture. Since not all affected animals showed severe lameness during the growing period, it is likely that lesions began as a focal trauma, of cartilage and/or subchondral bone, and that joint movement or weight bearing further induced repetitive

trauma to cause osteochondritis dissecans.

One major problem in swine is lameness resulting in loss of productivity in breeding stock. While various factors (e.g. rapid growth rate) have been suggested to be causative (5), relatively limited attention has been paid to trauma that may occur during handling and transporting pigs (6). Boars to be tested for performance must be transported to and from a test station. The vulnerability of porcine elbow joints, especially of the medial humeral condyle, to osteochondral lesions observed in the present experiment, must be considered seriously when animals are moved. Trauma may be associated with relatively high frequency of osteochondritis dissecans in the medial humeral condyle (7) of boars culled because of lameness in performance

testing. Careful, quiet, patient handling of pigs (8) during penning, loading, transporting and unloading should help to reduce the incidence of joint lesions and lameness.

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