

ROBERT HANSON:

EPIPHYSIAL NECROSIS OF THE CAPUT FEMORIS

(Manuscript not received).

DISCUSSION:

Thomassen, Aarhus:

*(Calvé-Perthes-like Changes in the Head of the Humerus
in Swine).*

In connection with Robert Hanson's paper on epiphysial necrosis I should like as a preliminary report to mention some studies on epiphysial changes in swine. Morphologically and roentgenographically these changes have some resemblance to Calvé-Perthes' disease in man, the histopathology of which has been studied very little, however, as it is almost impossible to obtain material for such examination. Of histological studies I have been able to find in the literature only 13, some of which were carried out on cases of long standing, and others merely on small pieces of biopsy material.

The result of these few examinations rather supports the theory advanced by Axhausen about the primary necrosis with secondary pathological fracture and the resulting process of limitation in the head of the femur, in analogy to the well-investigated series of cases of Köhler's disease II at different stages of development which Axhausen presented in 1923.

The question of the etiology of this so-called aseptic bone necrosis has given rise to a very large literature, which cannot be said to have offered any satisfactory explanation.

Hoping that an animal material might give a better chance

to study the pathology and etiology of the disease I have examined 1482 humeri and 2203 femora of healthy bacon swine, about 6 months old and weighing about 65 kg. (slaughtered).

Among these femora only 5 showed deformities of the head

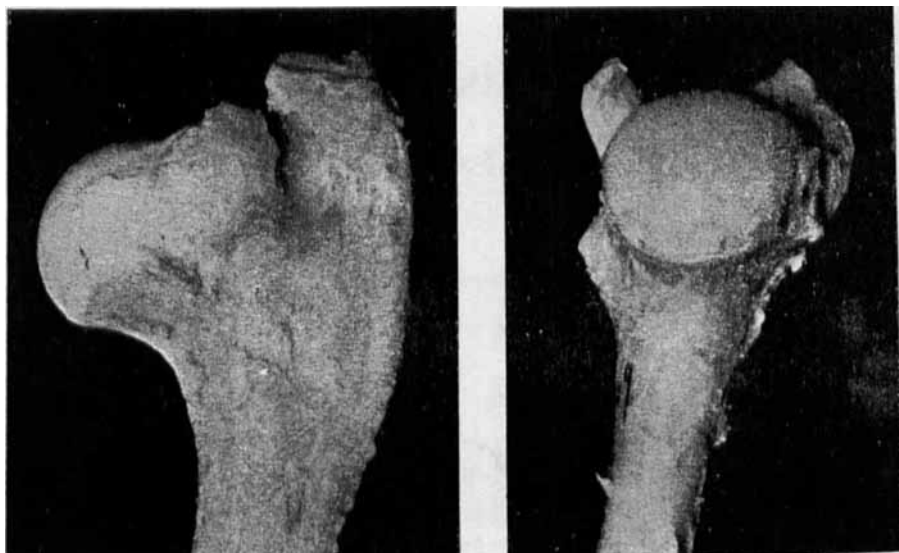


Fig. 1.

Normal head of the humerus of swine (2 projections).

resembling the results of slipping epiphysis to be further investigated.

Among the 1482 humeri I found 62 with marked deformity of the head, that is, about 4 %.

The deformity of the head has a distinct resemblance to the operative autopsy findings in Calvé-Perthes' disease: the head, which normally is spherical is here widened and flattened with an always continuous shiny articular cartilage, but over the most flattened area this cartilage is often somewhat folded or slightly nodular. In severe cases the head of the humerus is very broad and flat and the articular cartilage is nodular, but in no instance have I observed any marginal osteophytes or lesions of the cartilage.

Roentgenography shows subchondral clearings—in the severe cases macular clearings of the epiphysial structure and irregularities in the distribution of the epiphysial cartilage.

On section, the cut-surface of the head shows that the car-

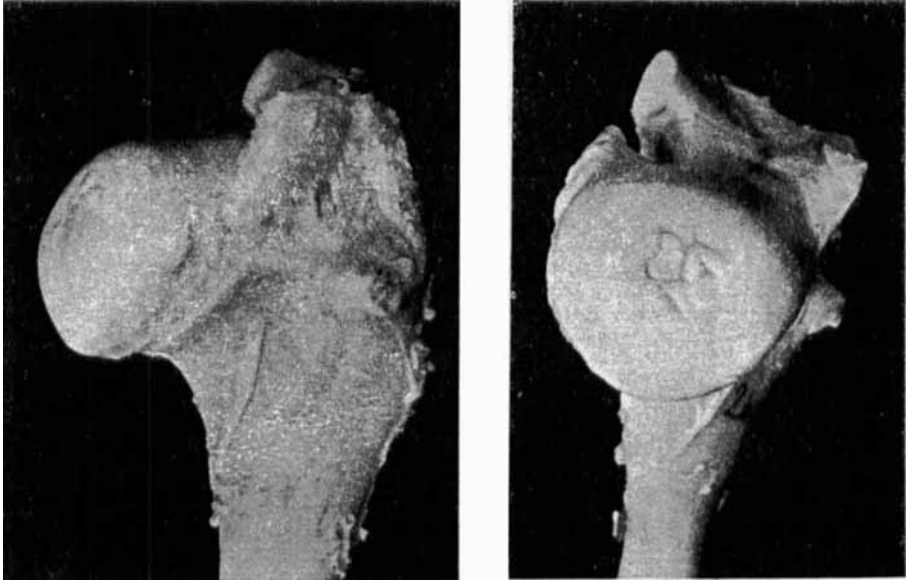


Fig. 2.

Deformed head of the humerus; central part flattened, with folded articular cartilage (2 projections).

tilage on the whole is preserved, only somewhat thickened, and the border between cartilage and bone is irregular over a greater or smaller area corresponding to the folded or nodular surface.

Beneath this cartilage, as seen also in the roentgenogram, there is a greater or smaller subchondral focus, which is soft, in many cases darkred, in other cases more solid and grey in colour. This focus is quite conspicuous on the background of the otherwise normal epiphysial spongiosa, which is light red in colour.

Histological examination: The thickening of the articular cartilage is found to be due to proliferation, especially in the

basal layers of the cartilage; and the normally distinct zone of calcification and bone formation is practically absent. On the border between bone and cartilage there is an irregular downgrowth of cartilage into the underlying marrow tissue, and

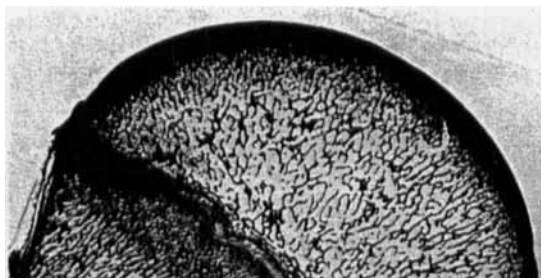


Fig. 3.

Normal head of the humerus. v. Gieson-Hansen stain. Magnif. $\times 2$.



Fig. 4.

Deformed head of the humerus. Hæmatoxylin-eosin. Magnif. $\times 2$. Beneath the centrally thickened, somewhat folded, articular cartilage the normally sharp border between cartilage and bone is absent; a subchondral slit is seen. Beneath this part of the articular cartilage there is a cone-shaped area in which osseous trabeculæ are almost entirely absent, while the surrounding spongiosa is more dense than normally. Epiphysial cartilage and metaphysis normal.

also ingrowth of vascular cones of connective tissue into the basal layers of the cartilage. In many preparations there is a narrow, often interrupted, detritus-containing slit under the thickened cartilage.

The subchondral focus often reminds of an infarct, as it is cone-shaped, with its base up against the joint cartilage. The otherwise normal spongiosa structure is absent here, and the marrow has been transformed into a mass of connective tissue,



Fig. 5.

Section from the area shown in Fig. 4, at the right part of the slit.

Magnif. $\times 40$.

The joint cartilage is seen above, with basal proliferation, and without the normally sharply defined zone of calcification, but with a broad ingrowth of vascular connective tissue to the left. Beneath the cartilage, at the left, the margin of the subchondral slit is barely visible. The marrow is very rich in cells, the blood vessels are congested. At the left, two large areas of cartilage: at the right, some irregular osseous trabeculae with osteoblasts and osteoclasts.

rich in cells, more or less fibrous, often resembling a callus, with large engorged blood vessels, irregular formation of cartilage and bone, with thin and irregular osseous trabeculae scattered here and there. There is no bone necrosis, neither fresh nor

remnants of an old process. On the other hand, many osteoclast-like giant-cells are seen around the detritus masses in the above-mentioned slit and also around areas of bone tissue undergoing solution. Also osteoblastic tissue is seen with osteoid formation at the delicate new-formed trabeculæ and on the surface of the

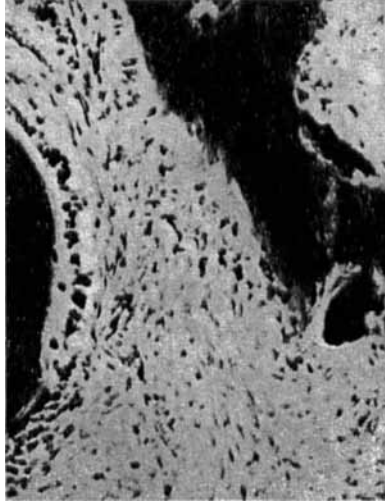


Fig. 6.

Lower right corner of Fig. 5. Magnif. $\times 240$.

Two dark osseous trabeculæ are seen showing distinctly osteoblasts and osteoclasts. At the left new-formation of bone, with a ring of osteoblasts located on a layer of non-calcified osteoid tissue. At the right, a bone trabecula undergoing absorption, with 2 large dark giant-cells (osteoclasts). The marrow is compact, rich in cells, but without marrow cells proper.

surrounding, somewhat coarser spongiosa, in which the fibrous marrow tapers out, so that the demarkation line of the "focus" shows a spongiosa structure more dense and coarse than normally.

There are no inflammatory infiltrations, and the blood vessels appear normal.

In the more severe cases the marrow has become fibrous here and there, and the spongiosa structure is irregular. On

account of its great widening, the epiphysial cartilage is often interspersed with areas of fibrous tissue.

Otherwise the epiphysial cartilage shows normal conditions, like the metaphysial spongiosa.

A few veterinary pathologists have described foci of fibrous ostitis in the epiphyses, and classified these phenomena as rachitic or as the so-called "Schnüffelkrankheit". But, as far as I can see, the etiology of the foci described has not been investigated very thoroughly, and no comparison has been made of these foci to similar changes in man.

Even though these epiphysial changes resemble only to some extent the morbid phenomena described as osteochondritis def. coxæ juvenilis, I think we have here a possibility of studying the pathology of the epiphysial bones on a more easily accessible material, and these studies will be continued.

Odelberg Johnson,

In connection with the demonstrated preparations of the humerus of swine, I should like to point out that a form of general ostitis fibrosa with skeletal deformities is a common finding in swine.

I should like to ask whether the changes shown in the preparations here might not be explained as healing phenomena after a local weight-destruction of a spongiosa that had already been impaired from such an affection as mentioned (ostitis fibrosa).