

The Departments of Orthopaedic Surgery and Radiology II, Regional Hospital,  
Linköping, Sweden.

## RADIOGRAPHIC DETERMINATION OF CARTILAGE HEIGHT IN THE KNEE JOINT

TAGE MARKLUND & RUNE MYRNERTS

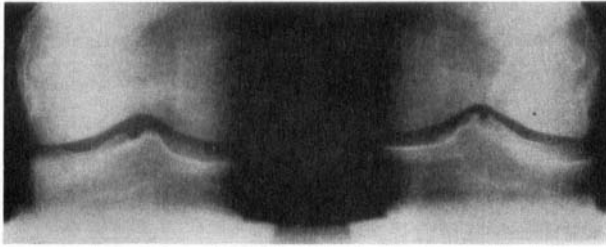
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In the radiographic determination of the cartilage height in the knee joint it is conventional to expose the film with the patient in the standing position. The condyles are then pressed together and the width of the articular space may be assumed to represent the true height of the cartilage. This has been demonstrated by Ahlbäck (1968). Even in this posture, however, a reduction in the height of the cartilage in the femorotibial joint may escape detection. Ahlbäck found that in a patient with advanced gonarthrosis (osteoarthritis of the knee joint) the width of the articular space can diminish after a few minutes' walking (prolonged weightbearing). The explanation this author advanced for this is that the irregular surfaces of the cartilage become better adapted to one another. The same author reports cases where a reduction in the height of the cartilage in the knee joint was not seen until the knee was flexed, or the flexed knee was forcibly abducted.

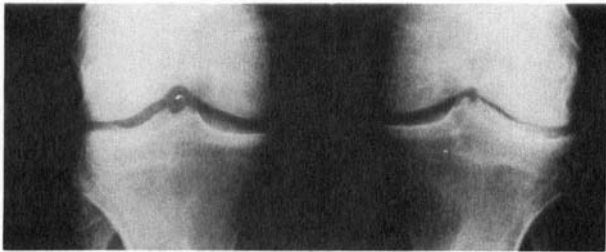
The study reported in this article was undertaken with the object of examining the significance of flexion of the knee joint for determining the height of the cartilage.

### MATERIAL AND METHOD

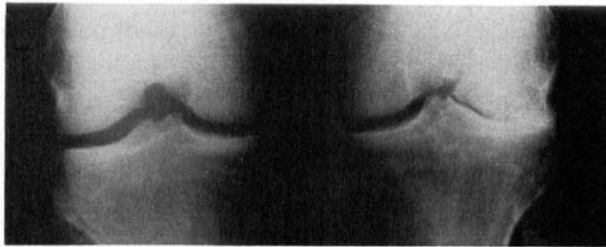
The case series for the study comprised a group of patients with normal, or fairly normal, width of the articular space and more or less advanced skeletal changes in the form of sclerosis, cysts and osteophytes. Despite well-defined secondary skeletal alterations there was remarkably little reduction in the height of the cartilage as seen with the patient in the standing position and the leg extended. These patients were submitted to another examination, also in the standing position, but now with the knee joint flexed to give an angle of about 170°. In some of the patients both knees were examined and the series therefore includes a number of joints with only minor, skeletal changes, if any. The material comprised 30 knees in 19 patients.



*Figure 1 a. Knees in hyperextension.*



*Figure 1 b. Knees without hyperextension.*



*Figure 1 c. Knees slightly flexed.*

*Figure 1. Patient with pronounced skeletal alterations in the left knee (in standing position).*

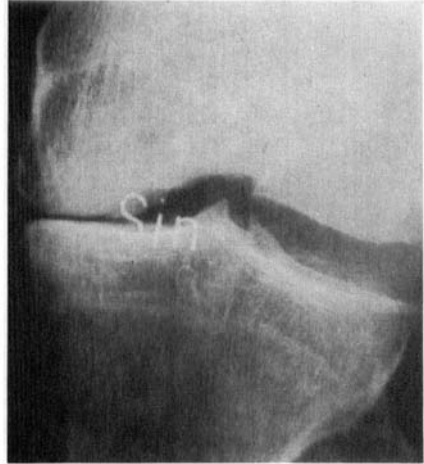
## RESULTS

*No skeletal alterations* were seen in 10 of the knee joints, and the width of the articular space was normal when the knee was extended and when it was flexed.

*Minimal osteophytes* were observed in 5 knee joints and they were located on the border of the articular surface. The width of the articular space in the standing position with the knee *extended* was normal



2 a. Knee in hyperextension.



2 b. Knee slightly flexed.

Figure 2. Patient with pronounced skeletal alterations (in standing position).

in all the patients. With the knee *flexed* the width was normal in all but one patient, where it was slightly reduced.

*Pronounced skeletal alterations* were recorded in 15 knee joints. Examined in the standing position with the knee *extended* all the articular spaces were normal, or practically so. When the knee joint was *flexed* to give an angle of  $170^\circ$  the articular space was completely obliterated in 5 patients (Figure 1 a b c), reduced to about half its earlier size in 2 (Figure 2 a, b), and diminished slightly in 5 patients. In 3 patients there was no evident difference from the former width.

#### CONCLUSION

In the standing position a reduction in the cartilage in the knee joint is more likely to be seen if the X-ray examination is conducted with the knee flexed than if it is extended.

#### DISCUSSION

The reduction in the width of the articular space on flexion of the knee is most likely due to a change in the thickness of the cartilage of the femoral condyle. In gonarthrosis this reduction is probably greatest on

that part of the femoral condyles, which articulates with the tibia when the knee is slightly flexed. Still the height of the cartilage of the part of the femoral condyles that articulates with the tibia on hyperextension of the knee may be normal. In spite of the fairly small change in the angle of flexion from hyperextension to about  $170^{\circ}$ , the articular space was diminished greatly in several of the patients—from 5 to 0 mm. The variability of the space sometimes recorded on repeated examination in the standing position may thus be ascribed to quite small differences in the angle of flexion of the knee joint. The change in the width of the articular space observed in some patients after walking for a time may have the same explanation.

#### SUMMARY

The reduction in the height of the cartilage in the knee joint can often be seen only on films exposed with the patient standing with the knees slightly flexed. A  $10^{\circ}$  angle is sufficient.

The width of the articular space with the knee extended or hyperextended may be due to the cartilage on the anterior part of the femoral condyle. To obtain a more reliable estimate of the reduction in the height of the cartilage in the femorotibial joint the examination should be carried out with the patient standing with slightly flexed knees.

#### REFERENCE

Ahlbäck, S. (1968) Osteoarthrosis of the knee. *Acta radiol.* (Stockh.) Suppl. 277.

Correspondence to:

Dr. Rune Myrnerts  
Department of Orthopaedic Surgery  
Regional Hospital  
Linköping, Sweden