STRESS RADIOGRAPHY IN DEGENERATIVE ARTHRITIS OF THE KNEE

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The accurate assessment of compartmental involvement in degenerative arthritis of the knee is important when planning operative treatment. Standard radiographic techniques often fail to define the degree of involvement of the less affected tibiofemoral compartment. The use of stress radiography in the preoperative assessment of 30 knees with degenerative arthritis is described and the radiographic findings correlated with the changes found at arthroscopy.

Osteoarthritis does not usually involve the three compartments of the knee symmetrically. When disease is mainly limited to one of the two tibiofemoral compartments, an operative procedure—either an upper tibial osteotomy or unicompartmental prosthetic replacement—may be contemplated and it is useful to assess the extent of the disease in each compartment before operation (Laskin 1978; Coventry 1979).

It is generally accepted that thinning of the articular cartilage is revealed radiographically by narrowing of the joint space (Leach, Gregg and Siber 1970). In films taken when the patient is not taking weight on the limb, accurate assessment of joint space narrowing is not possible; this led Ahlbäck (1968) to advocate the routine use of radiographs taken with the patient standing.

On weight-bearing, the joint space of the more involved compartment narrows; in the less affected compartment, it is often unchanged or it may increase in width as weight is transferred to the more affected side (Thomas et al. 1975). Weight-bearing films are therefore of little value in assessing the extent of disease in the less affected compartment, and this has led to the use of more sophisticated techniques such as double-contrast arthrography, radio-isotope scintigraphy and arthroscopy to achieve more accurate assessment.

The principle of stress radiography described by Coventry (1979) is that the radiological joint space represents the thickness of the intervening articular cartilage only when the joint surfaces are forcibly opposed. By applying a varus and then a valgus force to the knee, the degree of involvement of each compartment is revealed.

MATERIAL AND METHODS

Stress radiographs were taken of the knees of 30 patients who subsequently underwent unicompartmental or bicompartamental knee replacement. The radiographs were taken with the patient conscious. With the quadriceps relaxed, the knee was flexed about 20° to relax the posterior capsule, and the varus and valgus stress was applied by one of the surgical team. The joint space was measured using the method described by Hollingworth, Melsom and Scott (1982) after correcting for any magnification produced by the flexed position of the knee.

RESULTS

All the joints showed degenerative changes, predominantly in one compartment: 24 had a varus deformity and 6 a valgus deformity.

Joint space narrowing. Stress in the direction of angulation increased the deformity and reduced the joint space to zero in all cases. In every instance arthroscopy confirmed full-thickness loss of articular cartilage in the appropriate compartment (Figs 1 and 2).

When stress was applied in the direction away from the angular deformity, a joint space of 5 mm or more was maintained in 25 knees (range 5 to 11 mm, mean 8 mm); at arthroscopy the articular cartilage in all these compartments was found to be intact. In the remaining five knees the less affected joint space diminished to 3 mm or less; at operation significant degeneration of the articular cartilage was found, and total joint replacement was performed.

In more advanced arthritis, stress views were also of value in assessing the amount of subchondral bone loss in the more severely affected compartment (Figs 3 and 4). Angular deformity. With the knee in the fully extended position the angular deformity was never correctible. However, when stress was applied to the slightly flexed joint it was possible to correct the angular deformity to the neutral position in every case.
In three knees in which there was evidence of articular cartilage loss in both compartments, it was possible to overcorrect the deformity beyond the neutral position, and in these joints the anterior cruciate ligament was later found to be absent or severely damaged.

**Conclusions.** If a radiograph taken with the knee stressed retains a width of 5 mm or more in the compressed compartment, then the articular cartilage in that compartment is normal. This technique of radiographic measurement also allows pre-operative assessment of the degree to which varus or valgus angular deformity is correctible by surface replacement without soft-tissue release. Overcorrection of the deformity on stress suggests the presence of ligament damage as well as articular surface erosion.

The technique is simple to perform and gives more information than films taken when the patient is either supine or weight-bearing.

**REFERENCES**


