Percutaneous cartilage biopsy

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Method

A needle is described for obtaining specimens of non weight-bearing hyaline cartilage from the lateral femoral condyle. The hyaline cartilage of the femur continues onto the lateral surface of the condyle as a 'lip' which lies deep to the capsule of the knee joint and is readily accessible for biopsy.

The cylindrical needle is hollow with a sharpened cutting edge and is 5 mm. in diameter. Within the cylinder is a removable blade, which resembles an Archimedes screw. On rotating the needle, a flat spiral of cartilage is raised into the body of the cylinder and can be withdrawn. In contrast, a bone biopsy trephine will fail to remove a plug of tissue unless a deep biopsy is made and the plug levered 'to and fro'. The Archimedes blade is detachable and may be resharpened or renewed (Fig. 1, overleaf).

Considerable practice is necessary on cadaveric knees before specimens are taken from patients. In a preliminary series, these knees were opened to confirm that the biopsy had been taken from the correct area and that it included subchondral bone (Fig. 2).

The site of the biopsy is determined by palpation of the lateral femoral condyle and is best found with the knee flexed at about 45°. With full asepsis and under local

anaesthesia, the operator makes a 2 cm. incision through the skin, soft tissues, and joint capsule over the biopsy site (Fig. 3, overleaf).

A finger tip may be introduced into the wound to confirm the biopsy site by direct palpation. The needle is then pressed against the cartilage and rotated through at least 360° in a clockwise direction. Some discomfort may be experienced but is no more than for most biopsy procedures. Closure with three silk sutures is usual and the patient may walk after 24 hours.

Patients

A series of ten biopsies was performed, all of which have been without sequelae, in particular haemarthrosis or pyarthrosis. All the patients have retained their full range of movement. One subject found the procedure to be too painful, but subsequently with premedication all patients found the procedure to be acceptable. Details of the ten patients studied are shown in the Table (overleaf).

Discussion

Our understanding of diseases of cartilage is in its infancy. By this technique we are able to obtain specimens of living cartilage. This has important

FIG. 2 Site of biopsy confirmed on cadaveric knee

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FIG. 1 Cartilage biopsy instrument with detachable Archimedes blade

diagnostic and research applications. Cartilage disorders such as chondrocalcinosis may be present and yet not be revealed on radiography. There is probably a variety of disorders which are all rather loosely grouped together as osteoarthritis or degenerative joint disease. In inflammatory arthritis this technique should demonstrate the degree of articular cartilage damage and may well indicate whether the disorder is too far advanced for synovectomy. We should be able to further our knowledge of the biomechanical structure and function of hyaline cartilage. Specimens can be studied by scanning and transmission electron microscopy, and by electron-microprobe techniques (Gardner and Hall, 1969). Important enzyme changes may take place in hyaline cartilage at an early stage of inflammatory arthritis and also in osteoarthritis. Histochemical studies may provide a useful guide to the understanding of these enigmatic diseases.

DePalma, Dickson McKeever, and Subin (1966) followed the healing of experimental cartilage lesions in dog knees. No healing followed a partial-thickness cartilage injury. However, after full-thickness cartilage loss, including the subchondral bony plate, repair was macroscopically complete by 16 weeks. Histologically, the new material showed immature

FIG. 3 Diagram of biopsy site on lateral aspect of lateral femoral condyle

cartilage cells in a matrix. By the final examination at 66 weeks, the site of the original damage showed mature chondrocytes and a new subchondral plate filling the bony defect. This repair occurred in both young and adult animals.

Using the current technique we obtain full-thickness specimens of cartilage so that complete repair of the defect is to be expected. It has been our concern that removal of hyaline cartilage might leave a deformity of the surface and perhaps disturb the joint function. The specimen is removed from a non-weight-bearing surface which does not articulate with the tibia, the intervening meniscus, or the patella. If there is any residual defect it is therefore unlikely to be of any consequence.

Summary

We describe a biopsy needle for obtaining hyaline cartilage under local anaesthesia. The specimen is obtained from a non-weight-bearing, non-contact area of hyaline cartilage on the lateral femoral condyle. The technique does not upset patients and has been performed without sequelae or impairment

Table *Clinical particulars of ten patients*

<i>Case No.</i>	<i>Disease</i>	<i>Specimen</i>	<i>Complications</i>
1	Chondrocalcinosis Attacks of pseudogout X ray showed calcified cartilage	Cartilage	None
2	Rheumatoid arthritis, early stage, seronegative	None	Too painful
3	Rheumatoid arthritis, late stage Synovectomy 3 months earlier	Cartilage	None
4	Osteochondromata of several peripheral joints	Cartilage	None
5	Osteoarthritis of hips and knees	Cartilage	None
6	Rheumatoid arthritis, late stage Synovectomy 3 months earlier	Cartilage	None
7	Rheumatoid arthritis, early and mild Patient complained of a clicking sensation in the knee	Cartilage (Fig. 4)	None
8	Osteoarthritis of knees, 2 years' duration, with increasing valgus deformity	Cartilage	None
9	Rheumatoid arthritis, late stage Biopsy taken before synovectomy, which showed correct situation of biopsy, but the lateral condyle was denuded of cartilage	Bone	None
10	Villonodular synovitis, confirmed at synovectomy	Cartilage	None

FIG. 4 *Cartilage biopsy taken from a patient with rheumatoid arthritis, showing an early erosion of surface cartilage by pannus (Case 7). $\times 120$*

of joint function. Evidence from animal experiments has suggested that healing occurs in hyaline cartilage provided full-thickness specimens are taken. We feel that this instrument will be a useful diagnostic and research tool.

References

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 DEPALMA, A. F., DICKSON MCKEEVER, C., AND SUBIN, D. K. (1966) *Clin. Orthop.* no. **48**, p. 229 (Process of repair of articular cartilage demonstrated by histology and autoradiography with tritiated thymidine)

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