loss of crystals occurring either during tissue preparation or in vivo. Crystals were situated either randomly in the matrix, many of them within a few micrometers of the articular surface, or around the cells. Although the number of crystals varied, this did not seem to be related to the time interval between the fracture and the sampling of the tissue. X-ray emission microanalyses of crystals (n = 10) in formalin fixed sections showed calcium and phosphorus. The ratio of calcium to phosphorus, uncorrected for absorption, fluorescence, and atomic weight was 1.95 (SD 0.30), suggestive of apatite rather than pyrophosphate deposits.

Ultrastructurally articular surfaces were often roughened, though smooth to the naked eye, and showed infiltration with electron dense material. They were only rarely fissured. In many specimens the superficial collagen fibrils retained the normal density of packing and orientation tangential to the surface. More deeply, the fibres could show some disorganisation. Flattened chondrocytes were often present in the superficial zone. Chondrocytes in deeper tissue contained irregular lobed nuclei and several lipid droplets in addition to active Golgi and endoplasmic reticulum. Crystal deposition in the hip joints of these women may be related to osteoporosis, and this requires further investigation. Localisation of the crystals within the cartilage (superficial zone and pericellular regions) corresponds to sites of extracellular lipid in aging articular cartilage generally. Perhaps the most noteworthy features are the occurrence of crystals in non-arthritic hip joints, and their occurrence in all the elderly women in this group.

References

Ultrastructural studies of pyrophosphate crystal deposition in articular cartilage

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The mechanism of calcium pyrophosphate crystal formation in the articular cartilage of patients suffering from this crystal deposition disease has not yet been fully elucidated. It has been suggested that the earliest pyrophosphate crystal deposition is adjacent to chondrocyte lacunae and has been supported by light microscopical studies. Ultrastructural studies have also been performed on cartilage from patients with chondrocalcinosis but they have been restricted to the study of the changes in the matrix. We have embarked on an electron microscopical study of articular cartilage specimens from patients with calcium pyrophosphate crystal deposition disease and have combined it with electron probe analysis of the crystals to determine their chemical composition.

By using modified staining techniques it is now possible to show crystals in ultrathin sections of cartilage. Large islands of crystals were seen in the matrix, confirming earlier
Studies of pyrophosphate metabolism in relation to chondrocalcinosis


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In an attempt to understand the pathogenesis of chondrocalcinosis we have examined various aspects of the metabolism and breakdown of PP, and have investigated the extracellular metabolism of PP by these cells to define whether P could be produced outside cells and/or cross the cell plasma membranes.

In agreement with the findings of earlier studies, we observed no differences in the serum and plasma concentrations of PP between normal individuals and patients with chondrocalcinosis. In contrast, the amounts of PP in cultured articular chondrocytes and meniscus cells derived from patients with chondrocalcinosis were substantially higher than the PP contents of these cell types derived from normal individuals, especially during primary culture. However, this may not necessarily reflect a change in intracellular PP metabolism in these cell types in this condition, as it may be due to the continued presence of calcium pyrophosphate crystals that were present in vivo. For example, in one such culture derived from a patient with chondrocalcinosis crystals resembling triclinic calcium...