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Morphological study of cartilage cell death in patients affected by osteoarthritis and chondrocalcinosis

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The role of chondrocyte death in the pathogenesis of osteoarthritis (OA) has been largely discussed in literature, but its relative contribution is difficult to assess (1). Chondrocyte death, be it apoptotic, necrotic or chondroptotic, has been clearly documented in OA and a certain correlation between the degree of cartilage damage and chondrocyte apoptosis has been demonstrated (2;3). Conversely, the relationship between the different types of cell death and chondrocalcinosis (CC) is still little known, as well as the presence and role of chondroptotic cells. The aim of this research was to compare chondrocyte behavior in the cartilage of osteoarthritic and chondrocalcinotic knees, evaluating the different types of cell death by means of optical and electron microscopy. During total knee replacement surgeries, cartilage specimens of femoral condyle have been withdrawn and their transversal semithin sections, stained with toluidine blue and alizarin solutions, have been investigated by optical microscopy. From the same samples, thin sections were obtained for transmission electron microscopy to evaluate, at high magnification, the specific ultrastructural features of different types of cell death. Cartilage specimens from both conditions revealed a thickness reduction of superficial layer and a high number of empty lacunae in the middle layer. Calcium pyrophosphate crystals appeared in the samples of patients affected by CC. In osteoarthritic cartilage, numerous chondrocytes revealed necrotic features, whereas, in chondrocalcinotic tissue, the middle zone was characterized by morphological patterns suggestive of chondroptosis, such as chromatin condensation mostly localized at the nuclear periphery, mitochondria alterations, a marked increase in endoplasmic reticulum, the presence of a diffuse autophagic component and the extrusion of cellular material into the lacunae. In conclusion, a different distribution of cell death types seems to characterize the intermediate layers of cartilage specimens from patients affected by CC compared to OA.

References

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Keywords

Chondrocalcinosis; osteoarthritis; chondroptosis; necrosis.