Institute of Experimental Morphology and Anthropology with Museum
Bulgarian Anatomical Society

Acta morphologica et anthropologica, 13
Sofia • 2008

Age Related Changes in the Cells of Intervertebral Cartilage End Plates

B. Landzhov

Department of Anatomy and Histology, Medical University, Sofia

The intact human lumbar intervertebral discs were obtained and examined histologically the changes that occur with the cells in cartilage end plate (CEP). The objectives of the study were to examine the morphologic features of the CEP at different ages. Hematoxylin-Eosin and Masson-stained slides were observed with light-microscopic technique. The material from cadavers and surgical specimens was obtained. With ageing the numbers of chondrocytes was changed and apoptosis increased parallel with decreasing of the cell density. The quantity of apoptotic cells is greater in old CEP than in younger. Different types of cells, thickness and calcification were found.

Key words: age-related changes, human intervertebral discs, cartilage end plate.

Introduction

Cartilage end plates are parts of intervertebral disc, which lies between the vertebral body and annulus fibrosus. They are thin hyaline cartilage plates and form the anatomical and physiogical boundary of the disc which facilitates the diffusion of nutritients from the vertebra into the disc. Nutrients and metabolites that supply disc cells pass through the cartilage endplate [10, 12, 13]. The cells of the CEP are change with ageing [5]. Age-related changes concern all structural components, cells death, density and proliferation [4]. With our study we can contribute to the understanding of the changes that occur in CEP with ageing.

Material and Methods

Cartilage end plates were examined by routine light-microscopic technique. The obtained cadaver and surgical material from IVD of humans at different ages (between 20 and 60 years old) was fixed in 10 % formalin. Paraffin-embedded material was cut on 7 μm sections and stained with Hematoxylin-eosin and Masson.

Results and Discussion

The changes, the localization and the number of the cells were observed in order to determine the age-related changes. CEPs decrease in thickness and disappeared with aging (Fig. 1). Apoptosis increased with ageing and cell density decrease [1, 2, 3, 6, 7, 8]. Parallel with this increased the degenerative changes in all parts of the disc. Clusters of cells proliferation were formed and concentric tears appeared. The quantity of apoptotic cells is greater in old CEP than in younger (Figs. 2, 3). Boos et al. [4] described degenerative changes in the morphology of young age. They observed some very mild cleft formation.

CEPs, avascular in adults and vascular in degenerative discs play a key role in the metabolism of the IVD [9, 10]. Decreasing in permeability of the CEP is the main cause of degeneration of the disc and depends on the morphologic state of the CEP [11, 12, 13] This hypothesis is not clear. With ageing also can be seen a cleft formation and fissures within the CEP (Fig. 4).

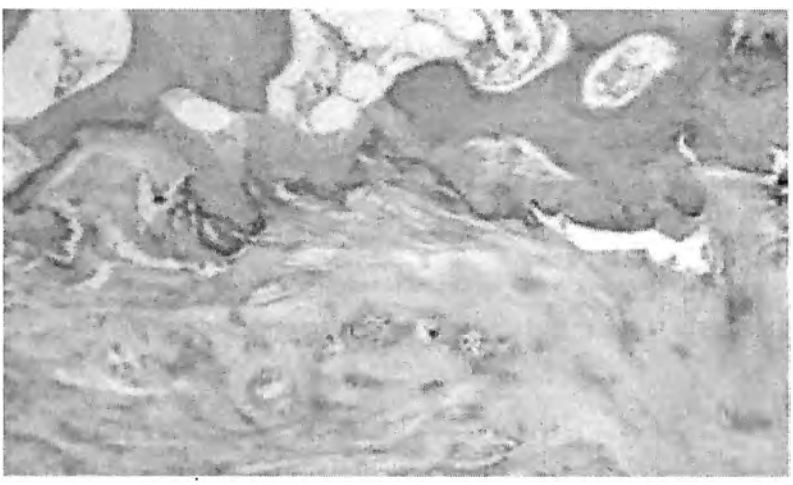

Fig. 1. 60 years old (HE, × 250)

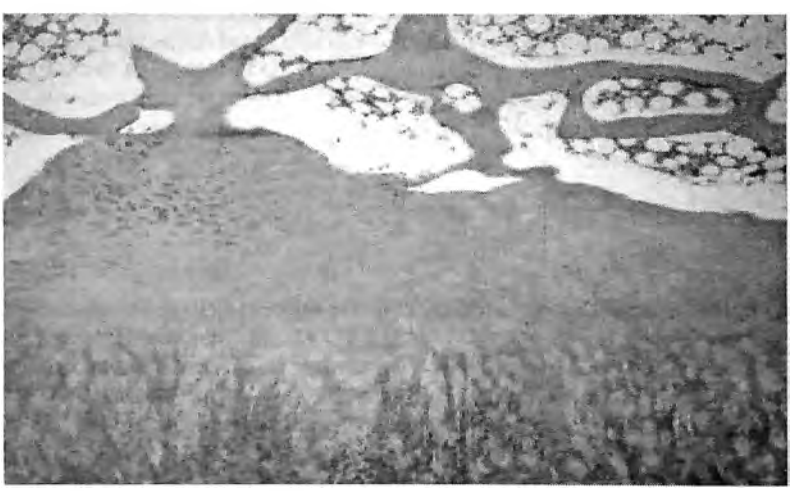

Fig. 2. 30 years old (HE, × 150)

Fig. 3. 25 years old (HE, × 200)

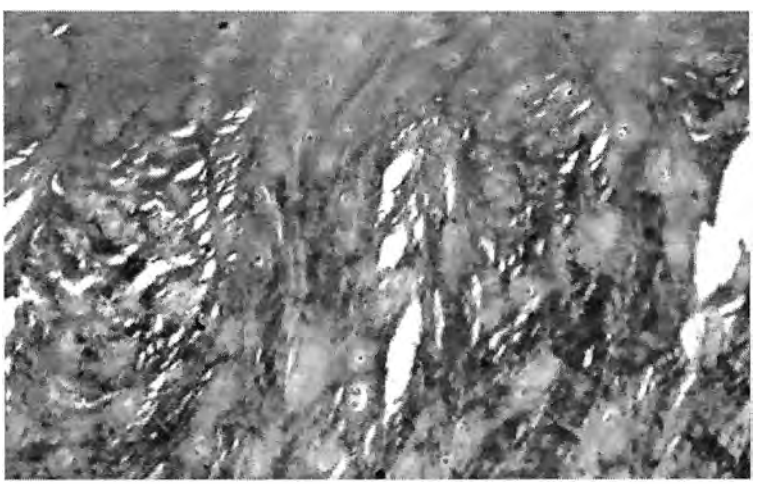

Fig. 4. 40 years old (Masson, × 250)

Conclusion

It is not enough known the process that occur within CEP with ageing. Cluster formations and new blood vessels appear with cell proliferation and degeneration. CEP decreases in thickness, disappears with aging and the chondrocytes change. These changes are very important in order to be understood the problems which occur in the disc.

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