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Past, present and future methods for the assessment of chondrocytes' viability: A new parameter for the determination of the postmortem interval?

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The determination of the postmortem interval (PMI) is one of the most important questions in forensic medicine. The determination of the PMI during the late postmortem changes is less precise due to the lack of objective methods. Cartilage is an isolated, avascular compartment. Chondrocytes are sparsely populated, mainly fed by nutrient diffusion from the abundant extracellular matrix, relatively resistant to oxygen starvation and acidosis. These attributes enable the chondrocytes to survive for several weeks after the individual's death. Several studies of long-term chondrocytes' survival have shown a gradual reduction in the viable chondrocytes' percentage as a function of time and the ambient temperature. The aim of our studies was to determine the most reliable combination of cartilage source and assay for the in vitro postmortem chondrocyte viability analysis in the conditions that imitate a dead body. In our studies in the past we used manual counting under a microscope (MCM), cell viability analyzer (CVA), a flow cytometer (FCM) and a confocal laser scanning microscope (CLSM). The largest reproducibility was presented for the knee joint and the CLSM which provided a slightly superior reliability over the CVA. Therefore, in the present studies we have used the CLSM, but because of the technical and cost-time issues, this method should be reserved for basic studies and the CVA should be used in future studies because the CVA is more appropriate for routine work. Additionally, during our work we concluded that the chondrocytes' viability (cartilage) could be a new parameter for PMI determination.

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