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Opioid concept in human articular cartilage and chondrocytes: expression and possible effect in cartilage-damaging states
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Purpose: Opiates have been of interest in research for their potential influence in stress, during injury, in surgery and during inflammation and infection. Both opiates and opioid-binding sites have been located in cartilage in animal models and the presence of opiate receptors has been confirmed in human synovial membranes and fluid. The present work focuses on potential influence from such substances on human cartilage and chondrocytes.

Methods and Materials: In the present study a search for opioid receptors and opiate production was done on cartilage and monolayer cultures of chondrocytes obtained from patients undergoing total knee arthroplasty. We also studied the influence of opiates on important mediators of inflammation like TNF-alpha and IL-1 beta produced by cultured chondrocytes. Various methods such as PCR, immunohistochemistry, immunocytochemistry and qualitative Western blot were used. To quantify beta-endorphins' effect on CREB and MAPK phosphorylation and TNF-alpha and IL-1 beta levels, we used semi-quantitative Western-blot and ELISA determination.

Results: We found that human chondrocytes do have mu-opioid receptors and can therefore be influenced by opiates. In addition, opioid stimulation of chondrocytes may regulate CREB, MAPK, IL-1 beta and TNF-alpha depending on the concentration of opiates and duration of incubation. Furthermore, the opioid effect on IL-1 beta was modulated via MAPK regulation. We did not find production of opiates in cartilage or chondrocytes.

Conclusions: Human articular chondrocytes may be influenced by opiates of both endogenous and exogenous origin via mu-opioid receptors. Opiates apparently can influence important processes such as inflammatory signals in human articular cartilage via CREB, MAPK and cytokine regulation.

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Expression of laminin binding receptors is a unique feature of immature nucleus pulposus cells
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Purpose: Cells of the immature nucleus pulposus may have potential to promote matrix synthesis and stem cell differentiation for applications in intervertebral disc (IVD) matrix regeneration. We have previously identified expression of specific laminin receptors in the nucleus pulposus, but not anulus fibrosus regions of the immature rat and porcine intervertebral disc (e.g., integrin α6 and CD239). The objective of this study was to evaluate expression of relevant laminin binding proteins in human immature disc cells towards the goal of finding unique markers for the immature nucleus pulposus.

Methods and Materials: Lumbar IVDs of juvenile patients without evidence of degeneration (2-15 yo) were dissected for cryosectioning. Cells were also isolated from anulus fibrosus and nucleus pulposus regions of the IVDs and cultured for 2-4 days. After fixation, both sections and cells were blocked and immunostained with antibodies to human integrins α3, α6, β1, β4 (BD), a laminin-related tetraspan (CD151, Santa Cruz) and Lutheran blood glycoprotein (CD239, Serotec).

Results: Immature nucleus pulposus tissue stained intensely positive for integrins α3, α6, β4, CD239 and CD151 in a pattern that appeared as a dense network connected to cells. In contrast, no staining (α3, β4, CD239) and very faint staining (α6, CD151) was found in the anulus fibrosus regions. Distinct differences were also noted between nucleus and anulus cells cultured in vitro.

Conclusions: Findings for differential expression of laminin receptors and related proteins in nucleus pulposus of immature IVD suggest that these proteins may be useful to distinguish immature cells and to phenotype regenerated matrix of nucleus pulposus.

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Comparison of invasive and non-invasive rigid body fixation for cartilage defect mapping using computer assisted surgery during knee arthroscopy
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Purpose: In all indication guidelines for the different cartilage repair techniques in the knee the size of the cartilage defect is crucial. For the accurate determination of the defect size computer assisted surgery (CAS) may be a possible tool for the future. The improvement of CAS through autologous osteochondral grafts could further reduce the size of the cartilage defect and therefore further reduce the size of the cartilage defect.

Methods and Materials: The study was performed on 2 cadaver knees were cartilage defects in different size and location on both femoral condyles were created. Afterwards the defects were assessed using a computer navigation system (Orthopilot®) and special computer software (Cartilage Defect mapping: CDM®). The measurement included the circumference, maximal height and maximal width of the area of the defect. Al measurement were done with invasive fixation of the rigid bodies in the femur and/or tibia and repeated with non-invasive fixation of the rigid bodies using rubber bands.

Results: There were no statistical significant differences in the calculated parameters for the cartilage defects using invasive compared to non-invasive rigid body fixation. All values outside the defined tolerance with more than 10% deviation were based on worst case scenarios like severe femur movements.

Conclusions: For further application of CAS during arthroscopy of the knee joint for cartilage defect mapping the use of non-invasive rigid body fixation can be recommended.