releasing scaffold for one-step cartilage regeneration therapies. Cells were isolated within 3 h of harvest, enriched for $CD271^+$ and seeded onto freeze-dried agarose constructs containing TGF-β3 releasing microspheres. Fresh unsorted cells were also seeded onto scaffolds as controls. Approximately 1 million unsorted cells were seeded onto each scaffold, while around 60 000 $CD271^+$ were seeded onto each scaffold (representing the 6% of unsorted cells positive for CD271). Cells from both populations were also assayed for their tripotentiality. Significantly more sGAG accumulated in scaffolds seeded with unsorted cells, but when normalised to DNA content, sGAG synthesis was higher in $CD271^+$ constructs. This suggests that the CD271- cell population also contains a population of chondro-progenitor cells. This study demonstrated the potential of combining TGF-β3 delivery scaffolds and freshly isolated SCs for AC repair.

07.05
Biomaterial-based anti-angiogenic drug delivery system enhances the in vivo chondrogenesis of freshly seeded chondrocytes-based constructs

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Standard cartilage repair approaches consist in the implantation of freshly cell seeded-constructs whose survival and further development might be compromised by the initial host reaction. Blood vessels ingrowth and macrophages migration within the implant might indeed accelerate its resorption. Control of VEGF signal has been shown to provide great benefits to counteract these problems (Matsumoto, 2009; Zentilin, 2006). We here propose a clinically relevant fibrin/hyaluronate scaffold functionalized with an anti-angiogenic drug (Bevacizumab) – a VEGF165A monoclonal antibody – which sequestrates VEGF from the surrounding environment. We hypothesized that blocking of angiogenesis right upon ectopic implantation in nude mice might provide a better survival, as well as a superior long-term quality, of not fully developed constructs generated by human nasal chondrocytes. We demonstrated that the initial Bevacizumab release efficiently blocked vessels ingrowth, as quantified by $CD31^+$ area inside the neoformed cartilage (0.2% vs. 1.0% at 3 weeks after implant), and enhanced both the in vivo survival of the constructs (75% vs. 18% at 6 weeks after implant) and the quality of the engineered cartilage in terms of GAG and collagen II expression, with respect to the not functionalized group. The proposed approach shows a great clinical potential, as it would allow the early implantation of cartilaginous grafts, achieving their in vivo maturation while retaining control over angiogenesis.

07.06
Keynote: Biomechanics and mechanobiology of cartilage defect repair

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Focal defects of articular cartilage are found commonly in both symptomatic and asymptomatic knees, and often progress over time. Aberrant strain occurs in the articular cartilage near a focal defect during compressive loading and sliding, and such strain may contribute to cartilage remodeling and deterioration, and predispose joints to secondary osteoarthritis. A functional implant would ideally restore both the biomechanics and mechanobiology of the articular cartilage. One approach to assessing the functionality of an implant, and its influence on surrounding and opposing cartilage, is to determine the biomechanics of repaired defects in an ex vivo model. Using such a biomechanical model with an osteochondral fragment from the human femoral condyle, samples with a full-thickness cartilage defect, compared to intact samples, was found exhibit abnormal strain in the cartilage adjacent to and opposing the defect when subjected to compression. Then, when the defect was filled with an implant with appropriate mechanical properties, the strains were normalized to those approximately of normal cartilage. Thus, such an ex vivo system allows systematic analysis of certain functional aspects of repair strategies for articular cartilage cartilage defects.

07.P01
Growth and differentiation of pre-chondrogenic ATDC5 cells on bioactive self-assembled peptide nanofibers

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Healing of cartilage defects is still a problem since the current treatments are ineffective to restore full function and return the tissue to its normal state. Cartilage tissue, having slower metabolism than other tissues, cannot repair itself after damage. For this reason, developing therapies for the treatment of cartilage tissue damages occuring as a result of common joint diseases like osteoarthritis and accidents is of major importance. Regeneration of damaged cartilage tissue and complete recovery of its functionality may be possible with tissue engineering studies that hold great promise by offering novel solutions for generation of functional tissue substitutes. Heparan sulfate proteoglycan molecules are important constituents of both developing and mature cartilage ECM. Several studies indicate that action of regulator proteins of cartilage development depends on these proteoglycans. Here we explored the role of heparan sulfate mimetic self-assembling nanofibers as a scaffold in inducing chondrogenic differentiation of chondroprogenitor ATDC5 cells. Chondrogenic differentiation is defined by sulfated GAGs deposition and expression of cartilaginous ECM proteins like collagen II and aggrecan. In insulin-free medium, ATDC5 cells rapidly aggregated and formed nodules and deposited sGAGs shown by Safranin-O staining. Moreover, qRT-PCR results showed that collagen II and aggrecan expressions are highly enhanced when ATDC5 cells are cultured on heparan mimetic scaffold.

07.P02
Low friction nanocrystallino-amorphous nc-TiC/a-C coating on Ti-6Al-7Nb alloy

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Titanium alloys are widely used for components of joint prostheses due to advantageous mechanical properties and excellent resistance to corrosion. The application of titanium and its alloys as biomaterials is limited by poor tribological properties (e.g. low wear resistance, high friction coefficient and tendency to gall). Therefore, in order to improve its tribological properties, duplex surface treatment combined oxygen hardening with deposition of low friction nanocomposite nc-TiC/a-C coating was applied. A microstructure, surface topography as well as micro-mechanical and tribological properties of the nc-TiC/a-C coating deposited on oxygen hardened Ti-6Al-7Nb alloy were examined. Analytical- and high-resolution transmission electron microscopy investigation on cross-section FIB lamellas was used for determination of a microstructure and phase composition of the coated alloy. It was found