the vertical orientation of collagen fibers. The biomineralized layer shows a highly fibrous structure with well interconnected pores with diameters up to 600 micron. Chemical characterization was performed to verify the composition and quantify the percentage of the inorganic mineral content.

The biomaterial was shaped in disks of 2.5cm of diameter and appeared to be suitable for culture of nasal chondrocytes for 5 weeks in perfusion bioreactor. Preliminary experiments showed the potential of the engineered graft for mimimally invasive treatment of osteochondral lesions.

PRECLINICAL ANIMAL MODEL – NOVEL TECHNOLOGY FOR ARTICULAR CARTILAGE REPAIR

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Nasal chondrocytes could be viable alternative for ACI in human patients. Before using it in clinical settings, it is necessary to test this hypothesis on translational (large animal) model.

Designed model was chronic, full-thickness cartilage defect placed on lateral and medial femoral condyles in sheep. The protocol included two surgical procedures. First procedure was to create two partial-thickness defects, 4 mm in diameter on the lateral and medial femoral condyle with a standard mosaicplasty instruments used in human orthopaedic surgery. Biopsy of nasal septum cartilage was also performed with skin biopsy puncher, 8 mm in diameter. Cartilage samples from both origins were used for production of autologous tissue grafts. Chondrocytes were isolated, seeded on biphasic collagen-hydroxiapatite scaffolds, and cultured in automated bioreactor for 5 weeks. Engineered tissue was then implanted in condyle defects during second procedure. First, 4 mm partial-thickness defects were converted to osteochondral defects 6,5 mm in diameter and 5 mm deep. Then engineered cartilage tissue was implanted. There were four study groups. Autologous tissue grafts, engineered from scaffold and nasal septum chondrocytes were implanted

in the experimental group of animals. One group was implanted with autologous tissue grafts engineered from scaffold and articular chondrocytes. In one group cell free scaffolds were implanted while last group served as negative control in which only conversion of defect was performed, but it was left untreated. Animals were sacrificed and tissue analysis was performed at three different time points: 6 weeks, 3 months and 12 months after the implantation. Tissue analysis included macroscopic, microscopic and molecular evaluation. Microscopic analysis included different stains (hematoxylin-eosin, safranin O, picrosirius) and immunohistochemistry (collagen I, II and aggrecan). Semi-quantitative data of morphology were obtained with histological score ICRS II. ELISA and DMMB assays were performed to quantify the amount of collagen I, II and glycosaminoglycans in repair tissue.

Results confirmed the feasibility of production of autologous cartilage tissue grafts from nasal septum chondrocyte for treatment of condyle cartilage defects. Furthermore, nasal chondrocyte grafts showed promising results in restoration of damaged articular cartilage.

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CARTILAGE TISSUE ENGINEERING FROM NOSE2KNEE: 12-MONTHS RESULTS OF A PHASE 1 CLINICAL TRIAL

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Purpose

As compared to commonly used cell based treatments for articular cartilage repair, grafting of cartilage tissues, engineered in vitro to reach a mature stage, could result in more durable repair. To reduce the variability in the quality of the engineered tissue grafts, nasal chondrocytes were used as a cell source with reproducible chondrogenic capacity. The purpose of this phase-1 study was to demonstrate safety and feasibility of the procedure. Preliminary indications on efficacy after 12 months are also presented.

Material and methods

Ten patients with symptomatic, post-traumatic full-thickness cartilage lesions (2-8cm2) on the femoral condyle/ trochlea were treated. Patients underwent nasal