attention is balneotherapy, in particular the use of natural sulfurous mineral spring water (SW). In fact, the latest OARSI guidelines for the non-surgical management of knee OA include balneotherapy as an appropriate therapeutic option for patients with OA in multiple joints and co-morbidities. Hydrogen sulfide (H2S) is the active component of sulfurous waters. Previous studies by our group demonstrated that exogenous supplementation of H2S-forming compounds to IL1β-stimulated OA chondrocytes exerts anti-inflammatory, anti-catabolic and anti-oxidant effects in these cells. In this work the capacity of natural SW to counteract the induction of inflammatory markers in OA chondrocytes stimulated with IL1β was evaluated.

Methods: Different sulfurous mineral waters were collected from several local springs. H2S concentration was quantified with an ion-selective microelectrode. Cell culture media was prepared by dissolving powdered DMEM in either distilled water (W) or each of the SWs. pH was adjusted and media were supplemented with 10% FBS, 1% glutamine, 1% antibiotics, and sterile filtered. These two media stocks were mixed in different ratios, namely, 25%, 50% and 75%. Viability experiments were performed using the different media prepared on a chondrocytic cell line (TC/28a2) and the alamarBlue® method. Then primary human OA chondrocytes were co-stimulated with IL1β (5 ng/mL) and the different SW containing media (SW from only one spring was used for these experiments). Nitric oxide (NO) production was quantified through the Griess reaction and the mRNA expression of iNOS and other OA characteristic markers (IL6, COX2, PTGES and MMP13) were quantified with qRT-PCR.

Results: All collected spring waters contained H2S concentrations ranging from 14.2 to 70.6 μM. Cells were viable in all culture media prepared with the different SWs (Fig. 1A). In other words, H2S concentrations up to 70 μM, which was the maximum concentration measured, did not negatively affect cell viability. In the IL1β-stimulated cells, increasing concentrations of SW in the culture medium dose-dependently reduced NO production from approximately 22 μM (NO2-) to less than 10 μM with 100% SW, demonstrating anti-oxidant properties (Fig.1B). Although only a qualitative measure, optical microscopy showed how increasing SW concentrations resulted in the recovery of the morphology that is normally observed in 2D in vitro chondrocyte culture (that had been altered by IL1β stimulation) (Fig. 1C). In the qRT-PCR analyses the expression of the mediators tested, iNOS, COX2, PTGES and MMP13, was already reduced to less than 5%, 12%, 10% and 5% of the stimulated values, respectively with the lowest SW concentration used (25%).

Conclusions: Naturally H2S-containing spring water can exert anti-oxidant and anti-inflammatory effects on IL1β stimulated OA chondrocytes in vitro.

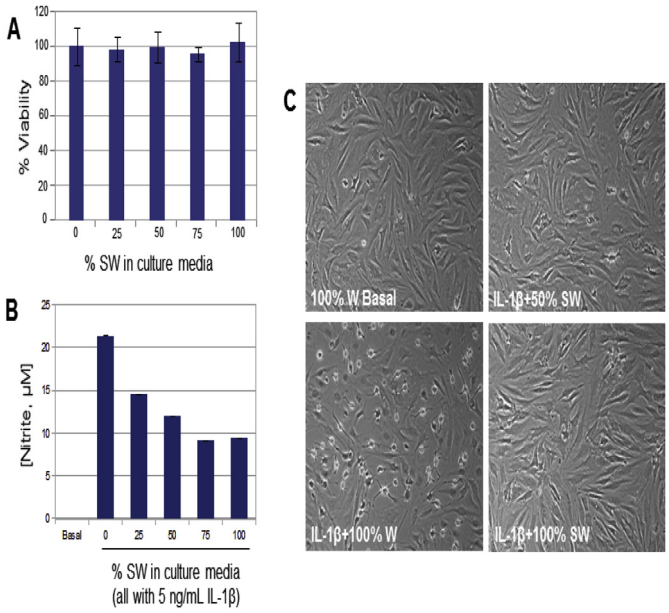

Fig. 1. Human articular OA chondrocytes stimulated with IL-1β (5 ng/mL) in culture media prepared with different proportions of sulfurous water. W: medium prepared with distilled water; SW: medium prepared with sulfurous water. A) Cellular viability; B) Nitric oxide (NO) production; C) Optical microscopy images of cultured cells.

855

EFFECTS OF LOWER LIMB EXERCISE TRAINING WITH WHOLE BODY VIBRATION ON FEMORAL ARTICULAR CARTILAGE IN PATIENTS WITH KNEE OSTEOARTHRITIS

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Purpose: Osteoarthritis (OA) is the most common degenerative joint disease leading to typical degradation of articular cartilage. Vibrations produced in oscillating/vibratory platform generate whole body vibration (WBV) exercises, which are important in sports, as well as in physiotherapy treatment. WBV exercise is a mechanically and biologically potential stimulus and a feasible, curative strength-exercise technique. Validity and reproducibility of ultrasonography (US) in detecting joint structural pathology in OA was reported. The aim of this study was to investigate the effects of lower-limb exercise training with WBV on femoral articular cartilage thickness in patients with knee OA by using US.

Methods: Ten patients with knee OA (Kellgren & Lawrence grade 2 or 3), aged 52,27 ± 7,42 years participated in this study. Patients received WBV training program three times a week for 12 weeks, with a progressively increasing intensity. The WBV training program included lower limb static exercises (hip, knee and ankle muscles).

A high-resolution US device (Logiq E9, GE Healthcare, Milwaukee, Wisconsin, USA) was used to scan knee joints. All ultrasonographic evaluations were performed by the same radiologist. All subjects were examined while seated and facing the examiner with both knees in maximum flexion. Cartilage thicknesses were measured with US from the three regions in the effected knee: the lateral femoral condyle, the medial femoral condyles, and the intercondylar notch. All ultrasonographic measurements were performed by the same radiologist. All subjects were examined while seated and facing the examiner with both knees in maximum flexion. Outcome measurements were performed before training and post-training period.

Results: All of the participants completed the 12-week study protocol. There were no significant differences between baseline and the post-training period regarding cartilage thickness in the medial femoral condyle ($p > 0.05$). There was an increase in the thickness of lateral femoral cartilage, but the increase was not significant statistically ($p > 0.05$). Whereas, femoral cartilage thickness at the intercondylar notch increased (baseline value: 0.19 ± 0.03 mm; post-training value: 0.20 ± 0.02 mm) significantly ($p < 0,05$).

Conclusions: Lower limb exercises on vibration platform improved cartilage thickness in the relatively non-weight bearing intercondylar notch in patients with knee OA. Femoral cartilage thickness as a response to OA treatment was documented previously with magnetic resonance imaging. However, to the best of our knowledge, no previous studies reported femoral cartilage thickness evaluated by US in response to OA treatment. One of the most promising results of this study is that we documented radiological improvement with US after three months of training with WBV, which is relatively a short period when the degenerative, irreversible nature of OA is taken into account. Further studies with long-term follow-up are warranted.

856

PATIENT-REPORTED OUTCOMES AFTER A 12-WEEK NON-OPERATIVE PROGRAM DIFFER BETWEEN PATIENTS PREPARING TO UNDERGO SURGERY COMPARED TO PATIENTS THAT ARE NOT

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Purpose: Recent guidelines for non-operative management of patients with knee osteoarthritis (OA) consistently recommend exercise and weight loss programs for overweight patients with knee OA, with good quality evidence suggesting moderate effect sizes for improvements in pain and function. However, whether or not these effects are consistent for patients receiving non-operative management while preparing for surgery vs. patients receiving non-operative management alone is unclear. Therefore, the purpose of this study was to investigate the effects of a 12-week optimized non-operative treatment program on patient-reported outcomes (PROs) for patients with knee OA that have elected to undergo surgery vs. patients preferring non-operative management only.

Methods: Patients with medial compartment knee OA were recruited from a single center specializing in orthopaedics. All patients were