The analysis of an original unloading brace for knee osteoarthritis

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Keywords: Unloading brace modeling; Osteoarthritis

Aim.– Braces are one of a range of physical treatments recommended for the treatment of the painful symptoms of osteoarthritis in the medial compartment of the knee [1]. In contrast with sleep braces, unloadingorthoses play a mechanical role in reducing the forces applied to the medial compartment during weight-bearing [2]. This study focuses on biomechanical analysis of an original unloading orthosis, the OdrA (Orthosis Distraction and Rotation for osteoarthrosis) isolated and fitted on subjects.

Material and method.– Using computer-aided design, kinematics of the brace is reproduced. The numerical simulation of mechanical effect of the brace is getting ahead experimental data obtained on patients with knee osteoarthritis with motion analysis and radiographic imaging used by EOS.

Results/Discussion.– This model reveals a significant distraction occurring during the movement of the knee from flexion to extension, providing a significant reduction in pain for the wearer. Also, lateral rotation of the knee highlights the result of this brace. However, this model doesn’t take into account sliding and deformation between the brace and the lower limb.

References

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(77.2%), professional activity (70.8%), walking (66.5%), self-image (63.5%) and family life (59.4%).

Discussion. – The results assist in better understanding patient experience, needs and profiles. This innovative survey is a first important step to better recognize osteoarthritis as experienced by patients.

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Posters

P192-e
Effect of low-level laser therapy on joint short-term and long-term pain, synovitis, anabolic and catabolic factors in cartilage of rabbits’ progressive osteoarthritis induced by ACLT
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Keywords: Osteoarthritis; Catabolic factors; Anabolic factors; Synovitis; Low level laser therapy

To investigate the effect of low-level laser therapy on joint short-term and long-term pain, synovitis, anabolic and catabolic factors in cartilage of a progressive rabbit OA model induced by ACLT. 72 New Zealand White rabbits were randomly assigned into 2 groups (ACLT and LLLT group). All rabbits received ACLT surgery and were treated 2, 4, 8, 12 weeks after surgery, with 12 rabbits in each study period being tested. LLLT is a helium-neon (He-Ne) laser (810 nm) of 13 J/cm², 3 times a week. Pain was tested by weight-bearing asymmetry. Synovitis was assessed by histology. Cartilage was evaluated by gross morphology, histology and gene expression analysis of anabolic and catabolic factors. Results showed that at least 6 week intermittent irradiation of LLLT could relieve short-term and long-term pain, synovitis, and anabolic factors in cartilage. LLLT plays a protective role against cartilage degradation and synovitis in rabbits with progressive OA, which could be achieved through the regulation of catabolic factors and anabolic factors in cartilage.

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P193-e
Effects of extracorporeal shock wave therapy on cartilage protection and subchondral bone remodeling in rabbits osteoarthritis induced by ACLT
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Keywords: Osteoarthritis; Extracorporeal Shock Wave Therapy; Cartilage Protection; Subchondral Bone

To investigate the effects of ESWT on cartilage protection and subchondral bone remodeling in rabbits osteoarthritis. Twenty-four rabbits were divided into two groups: ACLT group and ESWT group. Rabbits in two groups received ACLT to establish the knee osteoarthritis model. Rabbits from ESWT group received ESWT (Energy 1.6 ba, Frequency 5 Hz, 1200 shock, 3 times per week, total 6 times in 4 weeks). Histological observation of rabbit articular cartilage; the bone mineral density was measured. The bone histomorphometry analysis was done in subchondral bone of femoral and tibial. IL-1β, TNF-α and NO was detected by ELISA, RT-PCR was used to analyze MMP-1, MMP-3, MMP-13 and TIMP-1 in cartilage. Histological assessments of MFC in ESWT group were significantly lower than that in ACLT group. The BMD of distal femora and tibia was significantly lower than that in ESWT group. ESWT decreased the trabecular bone relative volume, trabecular bone thickness and increased bone separation. MMP-1 and MMP-3 in ESWT group was significantly lower and TIMP-1 in ESWT group was significantly higher than that in ACLT group. ESWT could protect cartilage damage and subchondral sclerosis by regulating MMP-1, MMP-3 and TIMP-1 in cartilage and modulating subchondral bone metabolism.

P194-e
Effects of whole body vibration on structural and functional remodeling of subchondral bone in osteoarthritis of rabbits at early stage
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Keywords: Osteoarthritis; Subchondral bone; Whole body vibration; Structural remodeling; Functional remodeling

Objective. – To investigate the effects of whole body vibration (WBV) on structural and functional remodeling of subchondral bone in early osteoarthritis (OA) rabbits induced by anterior cruciate ligament transection (ACLT).

Methods. – Twenty-four adult rabbits were randomly divided into two groups: ACLT group and WBVT + ACLT group. Rabbits in two groups received ACLT to establish the knee OA model. Rabbits from WBVT + ACLT group received WBVT (Intensity of frequency: 40 Hz, Amplitude of vibration: 2–4 mm, Treatment time: 40 min/d, Duration: 4w). After intervention, the left femur and tibia of two groups were placed in Micro-CT scanning system. Using three-dimensional reconstruction Mview V2.1.2 and ABA analyze software to analyze bone of the femoral condyle and tibial bone volume fraction (BVF), trabecular thickness (TbTh), trabecular spacing (TbSp), trabecular number (TbN), volumetric BMD, tissue BMD. Geomagic Studio 11.0 software was used to translate modulus (EM), the reaction force (RF) and average Von Miss Stress of femoral condyle and tibial plateau.

Results. – BVF, TbN, Tb.Th, EM, RF, VMF, vBMD tBMD of distal femur and tibia were significantly higher than that in ESWT + ACLT group (P < 0.05). Tb.Sp of distal femur and tibia were significantly lower than that in ESWT + ACLT group (P < 0.05). Conclusion. – WBVT could effectively improve the early stages of rabbit knee osteoarthritis subchondral bone microstructure and mechanical properties.

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P195-e
Effect of extracorporeal shock wave therapy on knee osteoarthritis
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Keywords: Knee osteoarthritis; Extracorporeal shock wave therapy; Functional outcome

Introduction. – Knee osteoarthritis (OA) is the most common type of arthritis and a major cause of morbidity and disability. Extracorporeal shock wave therapy (ESWT) has been found to improve motor dysfunction and reduce pain in OA in animals.