up and down three times: 29.6 s (SD 12.5 s) and walking 50 m: 34.4 s (SD 8.7 s); standing balance showed a total mean for all three groups of average angular velocity: 1.3 m s⁻¹ (SD 0.3 m s⁻¹); per cent maximum stability: 65.3 (SD 10.9) and per cent ankle strategy: 70.4 (SD 10.3); isometric muscle strength showed a total mean for all three groups of knee extension: 72.3 Nm (SD 25.6 Nm) and knee flexion: 37.5 Nm (SD 12.6 Nm).

Conclusions: Preliminary results indicate that WBV may affect the muscle function and balance in patients with knee OA. However, analysis is in progress, and the final results and conclusions will be presented at the congress.

P352
NONINVASIVE ACTIVATION OF BETA-ENDORPHINERGIC SYSTEM OF THE BRAIN USING “NEXALIN” DEVICE FOR TREATMENT OF OSTEOARTHRITIS PAIN
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Purpose: Research supports that the direct activation of the Beta-Endorphinergic Systems (BES) could successfully decrease the level of pain experienced. The "NEXALIN" design uses a proprietary waveform (US Patent 6,904,322 B2), based on a quasi resonance frequency of 77.5 Hz. This frequency was confirmed in many prior Russian trials and studies, as being key to stimulating the increase in concentration of beta-endorphins in the brain, spinal fluid and blood (SU Patent #1525200). The aim is to prove the possibility of decreasing pain caused by osteoarthritis (OA) by using transcranial electrostimulation (TES) via the "NEXALIN" device.

Methods: The study was multi-centered, randomized, double-blind, and placebo-controlled. The study population consisted of 211 patients who had been diagnosed with OA of knee and/or hip, had a pain history of at least three months, and scored 4 or more on the Visual Score for Pain Assessment. The "NEXALIN" groups received 7 daily TES sessions of 40 minutes, 15 mA (root mean square); the placebo group received no stimulation using a visually identical device. Assessment methods: pain level (PL), patient global self-assessment (PGA), walking time (WT), physician's assessment (PA) - all utilizing visual scales. Assessments were performed prior to treatment, during the treatment series, and at the 1 year follow-up assessment.

Results: After 7 treatments: PL decreased in the “NEXALIN” group 57%, placebo 24% (p<10⁻⁴), WT 54% and 30% (p<10⁻⁴); PGA and PA increased respectively 47% and 25% (p<0.04), 44% and 32% (p<0.03). After 2 weeks: PL decreased in the "NEXALIN" group 40%, placebo 21% (p<10⁻⁴), WT 42% and 30% (p<0.01); PGA and PA increased respectively 29% and 25% (p<0.66), 42% and 30% (p<0.01). Statically analysis also showed decreasing of PL in the "NEXALIN" group during at least 6 weeks.

The number and type of side effects were equivalent in both groups, with quantities in placebo exceeding active.

Conclusions: "NEXALIN"s' TES device, realized through activation of BES, provides significant and prolonged decrease in pain associated with OA,
caused by free nerve endings which existed in the capsule or synovium. Subchondral bone (SB) that obviously changes histologically as OA progresses appeared to have been neglected as a source of pain. We direct our attention to the pathological change of SB observed in OA knees to see it can be a source of pain.

Methods: Medial-type OA knees that received total knee arthroplasty (TKA) in our institution from April 2000 to March 2005 were involved in the present study. Their age, gender, X-ray grading, and knee functional score employing Japanese Orthopedic Association score (JOA score) were recorded at the time of TKA. All patients were underwent X-ray and MR imaging of the affected knees. At the time of TKA, weight-bearing area of medial and lateral femoral condyles (MFC and LFC) was obtained. They were stained with HE solution. Next, immunohistochemical examinations were performed using anti-cyclooxygenase 2 (Cox-2), anti-tumor necrosis factor-α (TNF-α), anti-substance P (SP) and neural class 3 beta-tubulin (TUJ1). The localization of the antigens was visualized by peroxidase-labeled strept-avidin-biotin staining kit. LFC, that were unaffected compartment, were used as control. The numbers of cysts that evaded SB were counted and cell population forming those cysts were analyzed.

Results: Two were male and 21 were female with ages ranging from 62 to 75 years (mean 67.7 years old). An average of JOA score was 49.6pts. X-ray showed that all the knees had OA changes in medial compartment and were graded 4 on Kellgren and Laurence grading scale. HE staining revealed that articular cartilage in weight-bearing area of MFC was worn out and part of the surface was covered with fibrous tissue in all cases. The average number of cystic changes was 22.2/10mm in MFC and 4.7/10mm in LFC. Total cell numbers of each cyst in MFC were 94.6cells/cyst and 55.2cells/cyst in LFC. A proportion of osteoblast to each cystic lesion was 78.5% in MFC, and 76.1% in LFC. Percentage of osteoclast and endothelium to each cystic lesion were 1.4% and 2.1% in MFC, and 0.7% and 2.3% in LFC. No significant difference about cell population in cystic lesions was found between MFC and LFC. Immunohistochemical examination revealed that certain cells in cystic lesions in SB observed in MFC were positively stained with Cox-2, TNF-α, Cox-2, TUJ1 and SP. Although more or less cysts with the same kinds of cell composition were found in LFC, no cell was positive for these antigens.

Conclusions: In the present study, we found that numbers of cystic lesions per unit area in MFC were about five times larger than that of LFC, and no significant difference about cell composition was found in cystic changes between MFC and LFC. Cystic changes observed both in MFC and LFC might be related to bone remodeling. But, considering that TNF-α, Cox-2, TUJ1, and SP were only positive for MFC, character of cysts were totally different between MFC and LFC. Especially, existence of SP and TUJ-1 positive cells in cystic lesions of MFC is direct evidence that SB is pain generator. SP is particularly suggested as one of the most important neuuropeptides in the modulation of the inflammatory process of arthritis. Existence of TUJ1 indicates the existence of neural fibers. So the existence of this pain-related molecule in certain cells in cystic lesions along with neural fibers strongly supports our assumption that SB is one of the sources of OA knee pain.

P354
ORIGIN OF OSTEOARTHRITIC KNEE PAIN: IMMUNOHISTOCHEMICAL ANALYSIS OF SUBCHONDRAL BONE
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Purpose: Osteoarthritis of the knee joint (OA) is the most common form of joint disease. But a mechanism of OA knee pain is poorly understood. OA knee pain has been thought to originate from deformation of periarticular tissues and secondary synovitis. Several authors have reported that pain in the joint mainly