[2011] [FRI0046] IN VIVO CALCIUM AND PHOSPHATE IONTOPHORESIS FOR THE TOPICAL TREATMENT OF OSTEOPOROSIS

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Background: We have recently developed a novel three-electrode iontophoretic apparatus involving the use of calcium- and phosphate-donating lattices suitable for local ion delivery into the bones. Here we performed *in vivo* studies on rats in order to compare the effects and efficacy of local electrotherapy with that of systemic hormone replacement therapy with respect to bone density and mineral content and biomechanical properties of osteoporotic bones.
Methods: Three months old Sprague-Dawley rats were either ovariectomized (OVX) or sham-operated (Sham). Five months later, tibias ofSham and OVX animals were subjected to serial local iontophoretic treatments (IOP). Other OVX rats received systemic subcutaneous 17β-estradiol therapy (E2, 100 μg/kg/week for 13 weeks) or were also treated with the combination of IOP and E2. Changes in bone density (as measured by quantitative ultrasound densitometry, QUS) were detected for 90 days after IOP. At the end of the experiments, biomechanical studies were performed together with elemental analysis assessing the calcium and phosphate concentrations.
Results: Osteopenia developed 21 weeks after OVX in the proximal tibial regions. Serial iontophoretic treatment resulted in a long lasting increase in bone density in both the Sham and OVX animals. Similar changes in QUS data could be detected after E2 monotherapy and further enhancement could be observed applying E2+IOP. The above improvement was also evident regarding the biomechanical features of the tibias (F_{max} and stiffness) as reduced calcium and phosphate content of the bones caused by OVX could be reversed by both serial IOP and E2 monotherapy, as well as combination therapy.
Conclusions: Local IOP using calcium- and phosphate-donating microparticles further enhances the efficacy of estrogen therapy by steadily increasing bone density, restoring the calcium and phosphate balance and improving the biomechanical properties of the bone.
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