EFFECTS OF ALENDRONATE ON GEOMETRY AND BONE MINERAL DISTRIBUTION OF THE HIP

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Fracture risk reduction by bisphosphonates is only partially explained by BMD. However skeletal structural and biomechanical characteristics play an important role in bone strength, but the effects of bisphosphonates on them has not been studied in detail. The aim of our study is to asses the effects of alendronate on the geometrical and biomechanical parameters of femur neck. We evaluated the impact of alendronate on periosteal diameter (PD), endosteal diameter (ED), cortical thickness (CT), cross sectional area (CSA), bending resistance (BBRI) and buckling ratio (BR). These parameters were studied in two clinical conditions affecting cortical bone, postmenopausal osteoporosis (PO) and primary hyperparathyroidism (PHPT). We carried out a longitudinal case-control study on three groups: 30 women with OP treated with alendronate 70 mg/w (OP/AL), 30 women with mild PHPT treated alendronate 70 mg/w (PHPT/AL). 30 osteoporotic women without treatment (PO) served as control group. Baseline and 12 month DXA hip scans (Lunar Expert) were reanalyzed to obtain femoral geometry and biomechanical parameters. All the groups were comparable for age, age of menopause and femur neck BMD. PHPT group had a baseline greater ED and DP than those in both osteoporotic group but not a significant greater CT. Consequently BBRI in PHPT group was significantly greater. There were not significant differences between OP and OP/AL in the baseline geometrical and biomechanical parameters. Hip BMD showed a comparable significant increase after 12 months of alendronate in OP/AL and in PHPT/AL versus their baseline values and versus 12 months hip BMD in OP group. After one year of follow up DP and ED increased in all three groups in different manner, so CT decreased in OP but thickened both in PHPT and in OP/AL. CT thickening was due to a reduced endosteal enlargment in OP/AL while it depended on both a reduced endosteal erosion and an increased periosteal apposition in PHPT/AL. BBRI improved in both group treated versus baseline value and versus OP, while BR improved only in PHPT/AL. Our data show that alendronate improves biomechanical parameters of femur neck through a displacement of cortical bone mass and suggest that alendronate may not improve cortical strength in a standard manner but endogenous or drug-induced hormonal environment may modulate its effect.