Perbedaan pengaruh latihan naik turun bangku dan jalan kaki terhadap perubahan kadar osteokalsin dan kadar CTX-1 serta hubungannya dengan polimorfisme gen TNFSF11 dan TNFRSF11B perempuan osteopenia = The difference effect between bench step and walking exercise on changes in levels of osteocalcin and CTX-1 and the role of TNFSF11 and TNFRSF11B genes polymorphism in postmenopausal women with osteopenia

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Abstrak

ABSTRAK
Latihan naik turun bangku LNTB dan latihan jalan kaki LJK adalah aktivitas bersifat weight bearing yang dapat meningkatkan massa tulang. Kedua latihan fisik tersebut memiliki karakter biomekanik yang berbeda yang akan memengaruhi proses formasi dan resorbsi tulang. Densitas massa tulang rendah berhubungan dengan polimorfisme gen TNFSF11 dan TNFRSF11B.Penelitian ini bertujuan untuk menganalisis pengaruh perbedaan peningkatan kadar osteokalsin sebagai petanda formasi dan penurunan CTX-1 sebagai petanda resorbsi setelah LNTB dan LJK dan pengaruh polimorfisme gen TNFSF11 SNPs-290C>T, -643C>T, -693G>C dan gen TNFRSF11B SNPs 163A>G, 950T>C, 1181G>C terhadap perbedaan peningkatan kedua petanda. Disain penelitian adalah studi eksperimental. Subjek penelitian adalah perempuan osteopenia sebanyak 59 orang yang diberi LNTB 30 subjek dan LJK 29 subjek dan ditentukan secara acak. Kadar osteokalsin dan serum diukur pra dan pascalatihan setelah 12 sesi selama 3 bulan latihan. Identifikasi polimorfisme gen TNFSF11 dan gen TNFRSF11B dianalisis dengan metode PCR dilanjutkan RFLP. Perbedaan peningkatan kadar osteokalsin dan CTX-1 diuji dengan uji T-tidak berpasangan. Hubungan polimorfisme dengan perubahan kadar osteokalsin dan CTX-1 dianalisis dengan odds ratio. Analisis haplotype dan uji Kruskall Wallis dilakukan untuk melihat hubungan pasangan haplotype dengan kadar osteokalsin dan CTX-1. Kadar osteokalsin dan CTX-1 setelah latihan pada kedua kelompok latihan meningkat p < 0,05 . Peningkatan CTX-1 setelah LNTB lebih kecil dibanding LJK p < 0,05 . Tidak ditemukan hubungan antara polimorfisme gen TNFSF11 dan gen TNFRSF11B dengan perubahan kadar osteokalsin dan CTX-1 p>0,05 Meskipun tidak bermakna, terdapat kecenderungan alel heterozigot/resesif berhubungan dengan peningkatan kadar osteokalsin, alel homozigot dominan berhubungan penurunan kadar CTX-1, serta haplotype gen TNFRSF11B dan haplotype gen TNFSF11 dengan perubahan osteokalsin dan CTX-1. Kedua latihan fisik terbukti dapat meningkatkan formasi tulang. LNTB mencegah resorbsi tulang lebih baik dibanding LJK. Polimorfisme mungkin memengaruhi formasi dan resorbsi tulang akibat latihan fisik. LNTB dan LJK meningkatkan osteokalsin. Peningkatan CTX-1 setelah LNTB lebih rendah dari LJK. Perubahan osteokalsin tidak berhubungan dengan polimorfisme gen TNFSF11 dan TNFRSF11B sedangkan perubahan CTX-1 tidak dipengaruhi polimorfisme gen TNFSF11 tetapi terdapat hubungan antara haplotype ATG dengan ACG dan GCC gen TNFRSF11B dengan perubahan CTX-1. Kata Kunci: gen TNFRSF11B, gen TNFSF11, karakter biomekanik, latihan naik turun bangku, polimorfisme, remodeling tulang
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Bench step exercise BSE and walking exercise WE have a different biomechanical characteristics that can

affect bone formation and resorbtion. Low bone mass density was associated with TNFSF11 SNPs 290C T, 643C T, 693G C and TNFRSF11B 163A G, 950T C, 1181G C genes polymorphism.The purpose of the studi is to analyze the difference effect of BSE and WE on changes in bone formation osteocalcin and bone resorbtion CTX 1 markers and the association of TNFSF11 and TNFRSF11B genes polymorphism. This is an experimetal study involving 59 postmenopausal women with osteopenia. Participants were grouped randomly according to the type of exercise bench step exercise 30 subjects and walking exercise 29 subjects . Subjects performed exercise for 12 sessions in 3 months. Osteocalcin and CTX 1 serum was measured pre and post exercise. The TNFSF11 gene and TNFRSF11B gene polymorphism was identified by PCR and RLFP methods. The difference in changes on osteocalcin and CTX 1 between groups were analysed by independent T test. Association between changes in osteocalcin and CTX 1 polymorphism and haplotype were analysed using odss ratio and Kruskall Wallis, respectively. Osteocalcin and CTX 1 increased significantly after BSE and WE P 0.05 , with no difference between group. BSE increased CTX 1 lower than WE P 0.05 . There is no association between polymorphism and the changes on osteocalcin and CTX 1 levels after BSE and WE P 0.05 . However, some tendencies were observed. Heterozygous recessive alleles had association with increased osteocalcin, homozygous dominant alleles had association with decreased CTX 1, haplotype TNFRSF11B gene had associaton with changes in osteocalcin and CTX 1 levels, whereas haplotype TNFSF11 gene with changes in CTX 1 level only. This results indicate that both BSE and WE increased bone formation. TNFSF11 gene polymorphism did not affect changes in formation and resorbtion after BSE and WE. Both exercises increased osteocalcin but was not different even though level of CTX 1 in BSE is lesser compared to WE. TNFSF11 gene polymorphism did not associate to the changes in osteocalcin and TNFRSF11B gene polymorphism did not associate to the changes in osteocalcin despite haplotype ATG had association with ACG and GCC in TNFSF11B gene for the changes in CTX 1 level after BSE and WE. Keywords Bench step exercise, biomechanical character, bone remodelling, gene TNFRSF11B, gene TNFSF11, polymorphism