accompanied with decrease of Tb.Sp and SMI ($p < 0.05$) compared to 0 Gy group at 8 weeks post-operation (Figure 3). The biomechanical results showed that the maximum push-out force of the implants in the 0.5 Gy group was significantly higher than that of 0 Gy group (Figure 4).

**Conclusion:** The results confirmed that local 0.5 Gy X-ray irradiation significantly improved the bone formation, trabecular bone microstructural morphology around the implant, which significantly increased the integrity of the implant with the bone tissue around it and may be beneficial for preventing the aseptic loosening.

**Methods:** 710 female subjects aged 60 or above were recruited and randomized into either control or treatment group on center-basis. The inclusion criteria included females aged 60 or above, active in the community and without any osteoporosis treatment. Treatment group subjects received LMHFV (35Hz, 0.3g) 20min/day, 5days/week for 18 months, while control group remained in habitual lifestyle. The occurrence of fall/fracture, muscle strength, balancing ability, quality of life (QoL), BMD of hip & spine were assessed at baseline, 9 months, and 18 months. Fifty randomly selected subjects further received 1 year of post-intervention follow-up to assess the residual effect of LMHFV. Cox regression, cluster-adjusted t-test and independent t-test were used for analysis.

**Results:** 18.6% treatment subjects reported falls while 28.7% in controls; the incidence rate in treatment group was significantly lower (adjusted IRR = 0.54, $p = 0.001$). 1.1% fracture rate was recorded in treatment group, compared with 2.3% for controls. The muscle strength of dominant and non-dominant legs were improved significantly in treatment group (both $p < 0.001$). In balancing ability test, treatment group showed significant improvement in reaction time, movement velocity and maximum excursion ($p < 0.001$ for all). In the high-compliance group (over 80%), BMD changes in the hip and spine showed lower bone loss within the study period when compared with the control group ($p = 0.02$ hip, 0.048 spine). One year after cessation of intervention, improvement in muscle strength, reaction time and movement velocity remained significant ($p < 0.05$ to all) in vibration group, when compared with baseline. Minimal adverse effects were documented.

**Conclusion:** LMHFV significantly reduced fall rate by over 40%, which is the key to prevent fragility fractures and other fall-related injuries. The beneficial effects of LMHFV were also confirmed in improving muscle strength, balancing ability and QoL as early as 9 months. One year after completion of LMHFV, muscle performance remained significantly better than baseline in vibration group, showing the sustainability of the effects from LMHFV. All these findings were critical in pushing forward the application of LMHFV in fall and fracture prevention in elderly.

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**EFFICACY OF LOW-MAGNITUDE HIGH-FREQUENCY VIBRATION TREATMENT ON PREVENTING MUSCLE LOSS IN COMMUNITY ELDERLY**

Chi-Yu Li, Kwok-Sui Leung, Wing-Hoi Cheung

Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong

**Background:** Sarcopenia is an age-induced progressive loss of muscle mass and strength, and associated with functional impairment in elderly. Low-magnitude High-frequency vibration (LMHFV) treatment was previously shown to improve balance ability and muscle strength. This study was to investigate the effectiveness of LMHFV on preventing loss of muscle strength and mass.

**Methods:** 60 female subjects aged 60 or above were recruited and randomized into control or vibration group. Vibration group subjects received LMHFV treatment (35Hz, 0.3g; $g$ = gravitational acceleration) 20min/day, 5days/week for 9 months, while control group remained sedentary in normal life style. Muscle strength, balancing ability, body composition, lower extremity functional scale and vibromography (VMG) assessment were performed at baseline and end-point (9-month).

**Results:** Significant enhancement of dominant and non-dominant leg muscle strength was observed in the vibration group after 9 months of LMHFV ($p < 0.001$ and $p < 0.003$ respectively). In the chair rising test assessing muscle power and balancing ability, vibration group showed significantly shorter time needed for sit-to-stand cycles than the control ($p = 0.009$). Significant increase of the lower extremity functional scale was also observed in vibration group ($p = 0.002$). No significant findings were found in the body composition and VMG assessment; however, a distinguish trend of increasing lean mass and VMG mean frequency were observed in vibration group. Also, minimal adverse effects were documented, and all subjects were well-tolerated for LMHFV treatment.

**Conclusion:** The effect of LMHFV on enhancing muscle strength, balancing ability and lower extremities functions were evident. LMHFV treatment was well-tolerated by elderly as a daily exercise with no adverse effects. The results support the use of LMHFV for lower extremity strengthening in elderly.