Can exercise interventions designed to reduce falls improve bone quality

[Abstract]

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Fractures can be prevented by both increasing bone strength and by reducing falls risk. There is some evidence that low load activities such as walking have at most a modest effect on BMD while high impact exercise or high intensity resistance training produce the greatest response (Kohrt et al. 2004, Med Sci Sports Exerc; Howe et al. 2011, Cochrane Review). Muscle strengthening and balance retraining exercises of sufficient duration have been shown to reduce falls. Although there is some evidence that that exercises designed to reduce falls can also reduce fractures (Cochrane review 2012), evidence on whether they can increase bone strength is sparse.

Participants were recruited from the larger ProAct65+ trial, a major primary care-based pragmatic 3-arm randomized controlled trial of 1256 men and women comparing group exercise and homebased exercise with usual care in older people aged 65 years and over (Iliffe et al. 2015, Br J Gen Pract). Both the group exercise (Falls Exercise Management or FaME) and home exercise (Otago Exercise Programme or OEP) arms are evidence based programmes designed to reduce falls (Campbell et al. 1999, JAGS; Skelton et al. 2005, Age Ageing). In the bone sub-study of the ProAct65+ trial (n= 319), BMD, bone mineral content (BMC) and structural parameters were measured before and after the 24-week intervention in a sample of participants in all 3 arms.

Ninety-two % of participants (N= 293) completed the bone sub-study of the trial. The OEP group completed 58 (SD ± 43) min/week of home exercise, while the FaME group completed 39 (±16) and 30 (±24) min/week of group and home exercise respectively, and the usual care group reported 15 (±32) min/week of home exercise. Femoral neck BMD changes did not differ between treatment arms: mean (95%CI) effect sizes in OEP and FaME relative to usual care arm were −0.003 (−0.011,0.005) and −0.002 (−0.010,0.005) g cm\(^{-2}\), respectively (p = 0.44 and 0.53). There were no significant changes in BMD or BMC at other skeletal sites, or in structural parameters (Duckham et al. 2015, Age Ageing).

These results suggest that currently used falls prevention exercise programmes may not improve bone strength in older people. To increase bone strength, programmes may need to be of longer duration or require additional exercises that exert higher strains on bone