Invited Speaker Plenary 2: Vitamin D & Bone Health

Vitamin D to prevent falls in older people in residential care

L Flicker¹, R MacInnis², M Stein³, S Scherer⁴, K Mead⁵, C Nowson⁶, J Thomas¹, C Lowndes⁵, J Hopper⁵, J Wark³⁵
¹University of Western Australia, ²Cancer Council Victoria, ³Royal Melbourne Hospital, ⁴Royal Freemasons’ Homes of Victoria, ⁵University of Melbourne, ⁶Deakin University

The incidence of falls is high amongst older women in residential care. As a consequence of their high falls incidence and also because of their bone fragility, women in residential care account for one third of all hip fractures in Australia. In nursing homes in France, calcium and vitamin D supplementation has been demonstrated to reduce fracture incidence. It has been postulated that vitamin D and calcium supplementation could reduce the risk of fracture through a reduction in the incidence of falls. Falling may be consequent upon impaired neuromuscular function previously reported in those with low vitamin D levels.

We had previously demonstrated vitamin D deficiency in about one fifth of Australian hostel and one half of nursing home residents (defined as a serum 25-hydroxyvitamin D (25D) less than 25nM), and associations between the level of serum 25D and falling in these residents both retrospectively, and prospectively. However, until recently there was little trial evidence to determine whether administration of vitamin D could reduce the incidence of falls in these residents. We considered it unethical to randomise residents with vitamin D deficiency and thus chose to study residents whose vitamin 25D level was in the lower half of the laboratory reference range but were not classically deficient.

Older people resident in 60 hostels and 89 nursing homes in urban and rural centres across three states of Australia were approached. Subjects whose 25D level was greater than 25 nmol/l and less than 90 nmol/l were randomised to receive either vitamin D supplementation or placebo, either 10,000 IU ergocalciferol orally once weekly or 1000 IU daily. Institutional staff and study staff were blinded to treatment allocation. All subjects were prescribed 600 mg of elemental calcium in the form of calcium carbonate. Each subject was followed for 2 years. Residential care staff recorded falls and fractures prospectively. Compliance with vitamin D therapy was monitored by pill counts. Logistic regression and negative binomial models were used to examine the effect of vitamin D supplementation on falls and fractures, both before, and after, exclusion of subjects with less than 50% compliance with vitamin D.

There were 665 falls observed in 486 person years in the vitamin D supplement group compared with 890 falls observed in 478 person years in the placebo group. Using the negative binomial model that accounts for all falls, the incident rate ratio (95% CI) for the vitamin D supplement group compared to the control group was 0.73 (0.57, 0.95). There was also a trend favoring vitamin D supplementation for the odds of ever sustaining a fall, Odds Ratio (OR) 0.82 (0.59, 1.12) and fracture OR 0.69 (0.40, 1.18). Excluding 85 subjects whose vitamin D compliance was not greater than 50%, revealed a moderate reduction in the incident rate ratio for falls with vitamin D treatment, 0.63 (0.48, 0.82), and a moderately lower risk of sustaining a fall OR, 0.70 (0.50, 0.99). All estimates were almost identical after further adjustment for baseline serum 25D level, removing those subjects who had poor compliance with the calcium supplements or who were non-ambulant. Number-needed-to-treat analyses, suggest that 12 people needed to be treated to prevent one of those people falling during the time of the study, or that 8 people needed to be treated for one year to prevent a fall occurring.

This was the first long term trial of vitamin D supplementation that has demonstrated a significant reduction in the rate of falls. Our conclusions from previous studies, and our own, is that vitamin D supplementation has the greatest effect in decreasing falls in those older people who are frail, and have low or suboptimal pre-existing vitamin D levels, and that additional calcium supplementation may be necessary to maximise this effect. The precise pre-existing 25D level at which vitamin D supplementation is beneficial requires further investigation, but it now seems clear that it is well above the level of frank vitamin D deficiency (25nmol/L). Based on these findings, all older people in residential care should be considered for vitamin D supplementation.

The researchers gratefully acknowledge the contribution of the residents, their families and nursing and personal care staff from many facilities across Australia. Funding for this study was provided by NHMRC and VHPF.