



## RACP Foundation Research Awards

### FINAL REPORT

<b>Project / Program Title</b>		The Optimisation of Bone Health in Chronic Neurological Conditions
<b>Name</b>		Dr Anne Trinh
<b>Award Received</b>		2015 Osteoporosis Australia RACP Research Entry Scholarship
<b>Report Date</b>		1 June 2017
<b>Chief Investigator / Supervisor</b>		Associate Professor Frances Milat
<b>Administering Institution</b>		Monash Health
<b>Funding Period</b>	Start Date:	1 February 2015
	Finish Date:	1 February 2016

#### PROJECT SUMMARY

As life expectancy in people with neurological conditions such as spina bifida and cerebral palsy improves, poor bone health and fractures are emerging as health issues for these patients. We have limited understanding of how often fractures occur in these patients. There is a clear need to investigate the extent and causes of osteoporosis in people with neurological conditions, and to establish the evidence needed to recommend the most appropriate treatments. Using a database of patients who attended Monash Health, we were able to analyse information about bone density, fracture and contributing factors to weak bones. We found in cerebral palsy, young adults were breaking bones in their 20s-30s with no trauma. Muscle mass and sex hormones were important factors for maintaining bone strength. In spina bifida, we found that children are at high risk of breaking their leg bone, but this risk reduced as they grew older. What was more concerning in adults was the high rate of obesity and obesity-related diseases.

#### PROJECT AIMS / OBJECTIVES

##### Aims and Objectives

The specific aims of this research are:

1. To determine the prevalence of low bone mineral density and fractures in young adults with spina bifida and cerebral palsy.
2. To assess bone microarchitectural (cortical and trabecular) parameters in this group.
3. To explore the relationship between bone mineral density, bone architecture, body composition and fractures.
4. To assess the prevalence of secondary causes of low bone mass in this population.

We were able to address aims 1, 3 and 4 during the period of the grant by undertaking retrospective cross-sectional studies of these groups of patients. Aim 2 is currently being addressed.

### **SIGNIFICANCE AND OUTCOMES**

In the cerebral palsy cohort, we were able to demonstrate that young adults were experiencing minimal trauma fractures, including vertebral fractures in their 20s-30s. Muscle mass was found to be an important determinant of bone density and maintenance of this will be key in these individuals as they age. Of concern, we also demonstrated (for the first time) the high rate of hypogonadism in this cohort and that it was associated with lower muscle mass and lumbar spine bone density. Future areas of research originating from this work include a retrospective study of patients we have treated with sex-steroids to examine bone density/body composition outcomes and caregiver satisfaction/concerns. This is in collaboration with paediatric endocrinologists at the Royal Children's Hospital (RCH). Also in collaboration with colleagues at RCH, we will be involved in a prospective study of adolescents with chronic neurological conditions and hypogonadism in a prospective manner to induce puberty and examine bone density/growth/body composition outcomes.

In the spina bifida cohort, we were able to demonstrate that children with spina bifida were at high risk of fracture, particularly of the distal femur. This risk of fracture however, lessened with time which we postulate may be due to growth and changes in the geometry of the femur.

In adults, surprisingly fat mass was a determinant of the variance in bone density. Most of our cohort were obese and many had complications of obesity despite the young age (20s-30s). The need to address obesity and cardio-metabolic complications is the primary outcome of the research in this group.

### **PUBLICATIONS / PRESENTATIONS**

J Clin Endocrinol Metab. 2016 Mar;101(3):1190-7. doi: 10.1210/jc.2015-3888. Epub 2016 Jan 11. Musculoskeletal and Endocrine Health in Adults With Cerebral Palsy: New Opportunities for Intervention. Trinh A, Wong P, Fahey MC, Brown J, Churchyard A, Strauss BJ, Ebeling PR, Fuller PJ, Milat F.

Dev Med Child Neurol. 2017 Feb;59(2):232-233. doi: 10.1111/dmcn.13355. Optimizing bone health in cerebral palsy across the lifespan. Trinh A, Fahey MC, Brown J, Fuller PJ, Milat F.

Intern Med J. 2016 Apr;46(4):506-7. doi: 10.1111/imj.13030. Severe acute phase response after intravenous zoledronic acid in adult patients with cerebral palsy. Trinh A, Wong P, Ebeling PR, Fuller PJ, Milat F.

Osteoporos Int. 2017 Jan;28(1):399-406. doi: 10.1007/s00198-016-3742-0. Epub 2016 Aug 24. Fractures in spina bifida from childhood to young adulthood. Trinh A, Wong P, Brown J, Hannel S, Ebeling PR, Fuller PJ, Milat F

Presentation: Australian Academy of Cerebral Palsy and Developmental Medicine, April 2016, "Musculoskeletal and hormonal health in adults with cerebral palsy: new opportunities for intervention"

Presentation: Australian and New Zealand Bone and Mineral Society Annual Scientific Meeting August 2016, "Fractures in spina bifida: childhood to young adulthood"

Poster: US ENDO Annual Scientific Meeting March 2017 "Characterisation of bone and body composition parameters in adults with spina bifida"