

## Fractures in children with cerebral palsy: a total population study

Uddenfeldt Wort U, Nordmark E, Wagner P, Duppe H, Westborn L (2013) *Fractures in children with cerebral palsy: a total population study. Developmental Medicine and Child Neurology* 55: 821 – 826. (Abstract prepared by Gaela Kilgour)

### Objective

To determine factors associated with fractures in children with cerebral palsy (CP) of varying mobility levels as classified by the Gross Motor Function Classification System (GMFCS I-V).

### Methods

An epidemiological study of 536 children with CP born between 1990 to 2005 was undertaken. Children were classified by type of CP and functional ability – those in GMFCS levels I–III were mobile, walking with or without aids (n= 384) and those in GMFCS levels IV–V mobilised via wheelchair (n=152). The following data were collected for 9 years and then analysed: gender, CP type, GMFCS level, gastrostomy, height, weight, use of a standing frame, antiepileptic drug therapy and fractures.

### Results

The risk of fractures was the same for children with CP in GMFCS levels I–III as for typically-developing children, and was not associated with any of the studied risk factors. The risk was similar for males and females and fractures occurred mostly between the ages of 10-14 years in children with CP. The risk of fractures without trauma increased in children in GMFCS levels IV–V who were on antiepileptic drug therapy, had stunted growth, did not use standing devices and were gastrostomy-fed. There was a fourfold reduction in fractures without trauma in those children using standing devices (GMFCS levels IV–V).

### Conclusions

Children with CP have varying risk of fractures based on their GMFCS level. Those in the GMFCS levels I-III had the same incidence and pattern of fractures as those typically developing children compared to those in GMFCS levels IV–V who had increased risk. Weight-bearing and adequate nutritional intake may help prevent fractures in children with CP.

### Commentary

Cerebral palsy is the most prevalent childhood condition associated with low bone mineral density (BMD) and osteoporosis. As a result children with CP are more likely to sustain painful fractures, often associated with minor trauma. These fractures can impair function, alter bony alignment, and significantly affect the quality of life of the child and their family/whanau. The risk is greatest for those children who are least mobile (GMFCS IV and V), have low nutritional and calcium status, less exposure to sunlight, use anticonvulsants, are gastrostomy feed and have lower fat mass (Fehlings et al., 2012). Finding ways to improve BMD and reduce the risk of fractures in CP is essential.

Standing frames are a regular part of physiotherapy treatment plans for children who require support for sustained standing and/or are less able to weight-bear themselves. In children with CP these would most often be prescribed by a physiotherapist for clients who are GMFCS levels IV or V (Palisano et al., 1997). Since standing frames are often prescribed for daily use at home, in preschools, schools and other community settings and the task is carried out by families and their carers, it is essential that we have sufficient evidence to justify their use.

The current evidence for standing frame use is limited. The most recent systematic review aiming to inform evidence-based practice guidelines reported there was insufficient evidence to support any form of weight-bearing activities as an effective intervention to improve BMD in CP (Fehlings et al., 2012). However, of the six weight-bearing studies that met their study criteria, only one involved standing frames. An earlier systematic review by Pin (2007) found that static weight-bearing exercises undertaken by individuals with CP had some effect in increasing BMD and temporarily reducing spasticity. However, these findings need to be interpreted with caution due to the relatively few studies examining the effectiveness of standing frames (2/10), a lack of research rigor, and small numbers of participants. This research also cautioned therapists into making anecdotal claims about the effects of standing frames on improving self esteem, breathing, circulation, communication, bowel and urinary functions as there have been no investigations of these factors.

Since these reviews, the research undertaken by Uddenfeldt Wort and colleagues (2013) provides some evidence for standing frame use based on fracture rates over a nine year period for children with CP of varying types and GMFCS levels. Fracture rates were highest in those least mobile and with the most risk factors, with fractured femurs most common. Children using standing frames showed a significant fourfold reduction in fractures without trauma. However, the "dose" of standing time was not mentioned. If fracture rates can be reduced by daily standing and BMD can be increased, the questions remain – how often, how long and how much weight-bearing is needed to make a difference? These factors are unknown and present a significant challenge to future researchers.

Physiotherapists have an important role in identifying and monitoring those most at risk of fractures, educating families of risk factors and encouraging adequate nutritional intake. It is also essential that all those involved in the care of children with CP are aware that the evidence supporting standing frame use to promote BMD is not conclusive. More research is required in this field if we are to advocate the use of standing frames as part of daily life for children with CP in GMFCS levels IV-V.

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### REFERENCES

- Fehlings D, Switzer L, Agarwal P, Wong C, Sochett E, Stevenson R, Sonnenberg L, Smile S, Young E, Huber J, Milo-Manson G, Kuwaik G, Gaebler D (2012) Informing evidence-based clinical practice guidelines for children with cerebral palsy at risk of osteoporosis: a systematic review. *Developmental Medicine and Child Neurology* 54: 106–116.
- Palisano R, Rosenbaum P, Walter S, Russell D, Wood E, Galuppi B (1997) Development and reliability of a system to classify gross motor function in children with cerebral palsy. *Developmental Medicine and Child Neurology* 39: 214–223.
- Pin T (2007) Effectiveness of static weight-bearing exercises in children with cerebral palsy. *Pediatric Physical Therapy* 19: 172–174.