

The Child with Multiple Fractures, What Next?



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KEYWORDS

- Fractures • Children • Osteoporosis • Bone mineral density
- Osteogenesis imperfecta

KEY POINTS

- Fractures in children are common; 16% to 25% of children sustain more than 1 fracture by adulthood.
- In the absence of severe trauma, the presence of at least 1 vertebral compression fracture, 2 or more long bone fractures by 10 years of age, or 3 or more long bone fractures by 19 years is an indication for further bone health evaluation.
- Bone fragility in children can arise either from a primary bone disorder (such as osteogenesis imperfecta [OI]) or secondary to an underlying medical condition.
- Ensuring adequate calcium and vitamin D intake, weight-bearing exercise, and minimizing exposure to adverse bone factors are important interventions.
- In children with bone pain or significant bone fragility (vertebral compression fractures or bone mineral density [BMD] z score less than -2), referral for specialist evaluation is indicated.

Fractures are a common occurrence in the pediatric population. With a prevalence that is increasing over time,^{1,2} up to 25% to 40% of girls and 30% to 50% of boys sustain a single fracture by adulthood.³⁻⁵ Between 16% and 25% of children have more than 1 fracture.⁶⁻⁸ Multiple fractures can, however, be an indicator of underlying bone fragility. The dilemma, therefore, when evaluating an otherwise apparently healthy child with a history of multiple fractures, is to distinguish between the child with intact bone health and the child who warrants further detailed investigation.

In adults, BMD as measured by dual-energy x-ray absorptiometry (DXA) is used to help diagnose and define individuals with osteoporosis who have an increased future risk for fractures.⁹ In contrast, for children, the diagnosis of osteoporosis cannot be

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made using bone densitometric criteria alone. The 2013 guidelines of the International Society for Clinical Densitometry (ISCD) outlined that bone fragility in children should be defined by a clinical significant fracture history, with, but not mandating, a low BMD or bone mineral content (BMC) below a z score of -2 for age and gender.¹⁰ Understanding the determinants of fracture risk is important to identify children who clinically have a significant fracture history and, therefore, need further assessment.

THE PATTERN OF FRACTURES IN CHILDHOOD

Fractures occur more commonly in boys, with a peak incidence at 11 to 12 years in girls and 13 to 14 years in boys,²⁻⁴ corresponding to periods of increased growth velocity. The rapidly growing adolescent skeleton undergoes a period of relative thinning of the bone cortices^{11,12} due to a delay between maximal longitudinal bone growth and peak bone mineral accrual (Fig. 1).¹³⁻¹⁵

The site of a fracture often depends on the mechanism of injury and the age of the child. Fractures of the distal forearm constitute the most common site of injury in all ages, accounting for 20% to 25% of fractures.^{3,16} Hand fractures, including the phalanges, carpals, and metacarpals, are the second most common fracture occurring in childhood but are seen usually as a result of crush injuries. In comparison, vertebral compression fractures are uncommon, accounting for only 1% to 5% of all fractures in childhood.^{3,17} The presence of vertebral body height loss should alert the clinician to the possibility of a bone fragility disorder.¹⁸

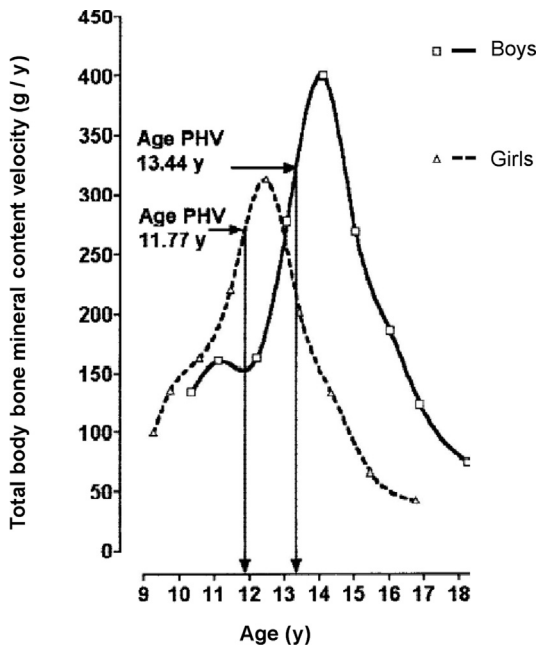


Fig. 1. Peak height velocity (PHV) precedes peak BMC accrual velocity by approximately 0.7 years. (From Bailey D, McKay H, Mirwald R, et al. A six-year longitudinal study of the relationship of physical activity to bone mineral accrual in growing children: The University of Saskatchewan Bone Mineral Accrual Study. *J Bone Miner Res* 1999;14(10):1675; with permission.)

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