

Are preterm infants at risk for subsequent fractures?

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SUMMARY In Cambridge, between 1979 and 1988, the prevalence of low gestation (<37 or <33 weeks) was not increased in 362 children under 6 years presenting to casualty with fractures compared with that in 362 children presenting without fractures or in all inborn surviving babies. These data are relevant to the assessment of suspected child abuse after preterm birth.

Metabolic bone disease is common in preterm infants,¹ and is associated with decreased bone mineral content and an increased risk of fractures in the neonatal period.² There is little information, however, on the persistence of reduced bone mineralisation, and whether early bone disease results in an increased risk of fractures in childhood. Such information would be of importance both clinically, and medicolegally, in the assessment of cases of suspected child abuse.

We conducted a study to test the hypothesis that premature infants, especially those under 33 weeks' gestation (the high risk group for early bone disease) are at increased risk of childhood fractures compared with infants born at full term.

Subjects and methods

A retrospective study of the accident service and paediatric department records at Addenbrooke's Hospital, Cambridge, was conducted, with ethical approval. The incidence of prematurity (<37 weeks and <33 weeks) was compared in three study groups. The index group comprised children ≤ 5 years of age, born within the period 1979-87, and presenting to the accident service with a fracture. A comparison group included the next patient in the accident service register ≤ 5 years of age presenting for any reason other than fracture. All these infants were born in the Maternity Hospital in Cambridge, and therefore comprised a defined local population. A second comparison group included the entire population of surviving infants born at the Maternity Hospital within the same period. Gestational age in the first two groups was determined from obstetric records, based on maternal dates and early scans;

and in the third from locally collected statistics, which showed that 6.8% of inborn infants were <37 weeks' and 1.1% were <33 weeks' gestation. Using the latter figures (which excluded in utero and neonatal regional transfers and neonatal deaths) we calculated a sample size of 700 subjects (divided equally between the index and accident service control groups) was required to detect a twofold increase in the proportion of children born preterm (<37 weeks) and a fourfold increase in those born at <33 weeks' gestation in the index group (for 5% significance at 80% power).³ In the index cases further information was collected on fracture site and age at presentation.

Results

A total of 362 index and 362 control cases were collected from the accident service records, together with data from the 34 837 births at the Maternity Hospital for the period 1979-87.

Table 1 compares the incidence of prematurity (<37 weeks and <33 weeks) between the three groups. No significant difference in incidence of prematurity was found between these groups.

In the index group, there was no difference in fracture site between the gestational age groups (table 2). Mean age of presentation with fracture was similar between the full term and preterm populations, but tended to be lower in the small subgroup born at <33 weeks' gestation.

Table 1 Incidence of prematurity in Cambridge inborn children ≤ 5 years of age (born 1979-87). Results are No (%)

Gestational age (weeks)	Index group (n=362)	Control group (n=362)	Inborn surviving infants (n=34 837)
<37	23 (6.4)	26 (7.2)	2369 (6.8)
<33	4 (1.1)	3 (0.8)	393 (1.1)

Index group: children presenting to the accident service with fractures; control group: children presenting without fractures; inborn surviving infants: all babies inborn during the nine year study period.

Table 2 Fracture site and mean age at presentation to accident service department for children ≤ 5 years of age

Gestational age (weeks)	Fracture site (No (%))				Mean (SD) age presentation at (decimal years)
	Limb	Skull	Other	Total	
≥ 37	287 (85)	21 (6)	31 (9)	339 (100)	3.4 (1.6)
33-36	16 (85)	1 (5)	2 (10)	19 (100)	3.5 (1.7)
<33	3 (75)	1 (25)	0	4 (100)	1.5* (0.6)
Total	306 (85)	23 (6)	33 (9)	362 (100)	

*Compared with infants ≥ 37 weeks, $p < 0.05$.

Discussion

Premature infants have an increased susceptibility to fracture in the neonatal period.² This study suggests, however, that a substantially increased risk does not persist into childhood.

A twofold increase in the incidence of prematurity (<37 weeks) and a fourfold increase in the proportion of subjects <33 weeks' gestation in the fracture group has been excluded by our study. Furthermore, given the similarity in proportions of subjects ≥ 37 and <33 weeks' gestation in the index cases and controls, a new study, based on our data, would require a population of infants larger than that born in Britain each year to challenge the null hypothesis (no increased incidence of low gestation in fracture cases).

We emphasise, however, that the fractures described in this study were those that presented clinically; we cannot exclude the possibility that occult fractures had a differential incidence between preterm and term infants. Occult rib fractures are seen frequently in sick preterm neonates, though how long these persist is uncertain. For fractures presenting clinically, there was no difference in fracture site between infants born term or preterm.

Our failure to show an increased fracture risk in preterm infants does not necessarily imply that they have normal skeletal maturation. Indeed, data from this group suggest that early bone disease is strongly associated with impaired linear growth in the first two years.⁴

There was a trend towards a reduced age at presentation with fracture in the small subgroup of infants born at <33 weeks' gestation. This may have

been a chance occurrence, and further investigation would require a larger sample.

Tensile strength of bone is related to bone mineral content, which has been found to be reduced in fractures in the elderly.⁵ Interestingly, no such association has been found in investigations of childhood fractures,⁶ raising the possibility they are more a reflection of a child's activity than due to defective mineralisation.

Our data indicate that preterm birth is not a major aetiological factor in childhood fractures. We suggest, therefore, that prematurity may not be an adequate explanation for a fracture in a case of suspected child abuse.

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