Changing incidence of slipped capital femoral epiphysis

A RELATIONSHIP WITH OBESITY?

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Obesity is thought to be an aetiological factor for slipped capital femoral epiphysis (SCFE). We analysed changes in the incidence of SCFE in Scotland over the last two decades. During this period rates of childhood obesity have risen substantially and evidence for a relationship between these changes and the incidence of SCFE was sought.

We found that the incidence of SCFE increased from 3.78 per 100 000 children in 1981 to 9.66 per 100 000 in 2000 ($R^2 = 0.715$): a two and a half times increase over two decades. It was seen at a younger age, with a fall in the mean age at diagnosis from 13.4 to 12.6 years for boys ($p = 0.007$) and 12.2 to 11.6 for girls ($p = 0.047$). More children under eight years old were seen with SCFE in Scotland in the decade to 2000 than in the previous decade ($p = 0.002$, $R^2 = 0.346$).

A close correlation was observed between rising childhood obesity over the last 20 years in Scotland and an increasing incidence of SCFE.

Although the aetiology of slipped capital femoral epiphysis (SCFE) remains unclear, it has been shown that obesity is a risk factor for development of the condition and for bilateral slips.1-3 The United Kingdom has experienced a dramatic increase in the incidence of childhood obesity over the last 20 years,4 but it is not known whether there has been a corresponding increase in the incidence of SCFE, or whether it is presenting at an earlier age.

The incidence of SCFE has been quoted as ranging between 0.71 and 10.8 per 100 000 children5-7 and is known to be related to such factors as race,6 gender,8,9 season10 and geographical location.11 Some studies5,6 have reported a fall in the mean chronological age at which SCFE may occur, but the mean skeletal age does not appear to have fallen correspondingly.12

Using a national database of National Health Service (NHS) Scotland activity, trends in the incidence of SCFE and the mean age at diagnosis have been analysed for the years 1981 to 2005. Slipped capital femoral epiphysis is diagnosed on plain radiographs, and it is unlikely that changes in case ascertainment over this period have occurred. Similarly, the established treatment has been surgical, which would require hospital admission and permit consistent case identification over this period.

Patients and Methods
In Scotland, all hospital diagnoses as defined by the International Classification of Diseases (ICD)13 are collated centrally by the Information Services Division of NHS Scotland. The codes for the diagnosis of SCFE were defined in ICD9 as 732.2, and in ICD10 as M93.0. All children aged between six and 18 years, with these codes, for the years 1981 to 2001, were requested from the database. Additionally, the age at diagnosis and the gender of the child were recorded. Data were then retrieved from Census Scotland 2001 (General Register Office for Scotland), which provided population statistics by age group for the years 1981 to 2000. The incidence of SCFE was calculated by combining these data and was expressed as cases per 100 000 children per year. We cannot comment reliably on the incidence after 2000, as accurate population data after that period are not yet available.

Data on the body mass indices of Scottish school children were reproduced from records held by the Information Services Division of NHS Scotland. This information had been collected as part of the Child Health Surveillance Programme, Scotland.

Statistical analysis. The ‘least squares method’ of regression analysis of the data was performed using the Excel Statistical Package (Microsoft Corp., Redmond, Washington).

A significant trend was defined as having a p-value < 0.05.
Results
Between 1981 and 2005, a total of 1169 patients in Scotland were diagnosed with SCFE. There were 734 boys and 435 girls. Figure 1 shows the incidence of SCFE per 100,000 six- to 18-year-olds between 1981 and 2000. The incidence increased almost threefold during this period, from 3.78 in 1981 to 9.66 in 2000. This trend was significant (p < 0.001), and Figure 1 shows this to be a consistent increase over the 20 years ($R^2 = 0.7149$).

The mean age at diagnosis decreased for both sexes between 1981 and 2005. In boys, the mean age fell from 13.4 to 12.6 years ($p = 0.007, R^2 = 0.270$) (Fig. 2). For girls it fell from 12.2 to 11.6 ($p = 0.047, R^2 = 0.160$). Slipped capital femoral epiphysis is rare in young children, and in Scotland between 1981 and 1990, only two children presented with a diagnosis of SCFE between the ages of six and eight years, although between 1991 and 2000, seven presented in this age group ($p = 0.002, R^2 = 0.346$).

It can be seen that the prevalence of overweight 13- to 15-year-olds in Scotland doubled between 1981 and 2005 (Fig. 3). More alarmingly, the percentage of children in this age group who were classified as severely obese quadrupled between 1981 and 2005 (Fig. 4).

Discussion
Although the number of children in Scotland between the ages of six and 18 years fell between 1981 and 2000, the number of cases of SCFE increased two and half times. This
condition can cause significant morbidity leading to subsequent degenerative changes in the hip joint or avascular necrosis following treatment. Although surgical treatment of minor slips is relatively successful, the outcome for severe slips is often poor despite the best available management.\textsuperscript{17,18} Early diagnosis of minor SCFE can allow effective treatment and prevent progression to a major slip.\textsuperscript{19} It is therefore highly desirable to identify SCFE early in its development, and this depends largely on clinicians being aware of the condition and alert to the changing epidemiology. The data presented here support other studies that report a fall in the mean age for the occurrence of SCFE\textsuperscript{5,6} and also show that the condition is becoming significantly more common. This is an important message for those in primary and emergency care settings.

It is possible only to speculate on the possible cause or causes of the changing epidemiology of SCFE. Although a fall in chronological age at puberty and corresponding earlier skeletal maturation is one hypothesis for the falling mean age at diagnosis, it does not provide an explanation for the rising incidence of SCFE in our population. Also, it has not been convincingly shown that the mean age of onset of puberty in European children fell during the period studied.\textsuperscript{20,21} Known contributory factors such as endocrine disturbance or trauma, have not become correspondingly more common. Although the ethnic mix in Scotland has changed over the last 20 years, there has been no substantial change in the proportion of children from races at higher risk of SCFE (0.15% Afro-Caribbean in 1991 to 0.16% in 2001).\textsuperscript{22} Sub-analysis of SCFE within Scottish ethnic groups was not possible from these data.

Increasing evidence is emerging that obesity is associated with the occurrence and severity of SCFE.\textsuperscript{12,13} It is likely that this is simply as a result of the increased mechanical load across the proximal femoral physis,\textsuperscript{23} but a physiological disturbance associated with obesity may have a role. Most Western societies have experienced an increase in the prevalence of childhood obesity over the last 20 years.\textsuperscript{4} The data presented here and reported previously\textsuperscript{24} show that Scotland has witnessed a particularly acute increase in this problem. The increased prevalence of obesity mirrors the increase seen in the presentation of SCFE in Scottish children. The aetiology of SCFE is known to be multifactorial, but obesity is a predisposing factor. The data presented here show that the increasing prevalence of obesity in Scottish children has been matched by an increase in the incidence of SCFE. This may be a previously unrecognised consequence of increasing childhood obesity, but one which adds a yet greater incentive to tackle the obesity epidemic.

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References