

The incidence of physiolyis of the hip

A population-based study of 175 patients

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We studied the epidemiology of physiolyis of the hip (or slipped capital femoral epiphysis) between 1946 and 1992 in 175 patients from a well-defined population. The incidence of physiolyis of the hip was calculated using the attack rate method, i.e., the sum of the annual incidences in each 1-year group. The risk of developing physiolyis was 1:998 for boys, 1:1756 for girls and 1:1267 for both sexes and did not change significantly during this period.

The average age at diagnosis was 13.6 (7–17) years in boys and 12.1 (8–15) years in girls and did not change to a significant degree during this period. The difference in the boy:girl ratio (1.8:1) and in the preponderance of the left hip being affected first (64% for boys and 52% for girls) did not change significantly during this period. No significant monthly variation was found in the onset of symptoms of physiolyis of the hip.

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Only a few reports on the incidence and epidemiology of physiolyis of the hip (or slipped capital femoral epiphysis) have been published (Henrikson 1969, Kelsey et al. 1970, Hägglund et al. 1984). The results of these studies are difficult to compare because of the various methods of calculation. In none of these studies has the attack rate (i.e., the sum of the annual incidences in each 1-year group) been used.

We investigated the epidemiology of physiolyis of the hip in a well-defined population and assessed whether changes had occurred during the period 1946–1992.

Patients and methods

The population of Gothenburg increased from 325,000 to 450,000 between 1946 and 1992. In the same period, the number of children (7–17 years of age) increased from 36,000 to 64,000. During this time, all the patients with physiolyis of the hip were treated in the Department of Orthopedics, Sahlgren's Hospital and Östra Hospital and the Department of Pediatric Surgery, Children's Hospital.

For this study, only patients diagnosed during childhood and adolescence (7–17 years of age) between 1946 and 1992 and living in Gothenburg at the time of diagnosis were selected, making a total of 175 patients. All the patients were white.

The attack rate was calculated as the sum of the annual incidence rates for every age group over the age period of risk. The annual incidence rates were calculated from the available population statistics in 1-year groups for each sex separately (1940, 1950, 1955, 1960, 1962 and then yearly in 1964–1992). The calculation was made for each year and for the whole period, for the entire group and for each sex separately. To evaluate the difference that had occurred in incidence (attack rate), a non-parametric regression based on ranks was used (Bickel and Doksum 1977).

The average age at diagnosis was calculated for each year and the whole period, for the whole group and for each sex separately. To evaluate the different average age at diagnosis for boys and girls, the Student's t-test was used and, to evaluate the difference that had occurred in age at diagnosis, a non-parametric regression based on ranks was used (Bickel and Doksum 1977).

The sex distribution and the side of the first affected hip were calculated for each year and the whole period, for the whole group and for each sex separately. To evaluate the boy:girl ratio and the side of the first affected hip, the χ^2 -test was used, and to evaluate the difference that had occurred, a non-parametric test using contingency tables was used (Lehmann 1975). Because of the small number of patients each year, the patients were divided into groups according to the year of diagnosis. 9 groups were created, 1946–1952, 1953–1957, 1958–1962 and so on.

Table 1. Annual incidence of physiolyis of the hip in 1-year groups in Gothenburg/Sweden, 1946–1992

Age at diagnosis	Number of patients			Population			Incidence (per 1000)		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
7	1	0	1	118,699	112,481	231,180	0.008	0.000	0.004
8	1	1	2	117,092	110,984	228,076	0.009	0.009	0.009
9	3	2	5	113,806	109,212	223,018	0.026	0.018	0.022
10	2	11	13	115,245	109,012	224,257	0.017	0.101	0.058
11	8	12	20	114,723	109,108	223,831	0.070	0.110	0.089
12	18	24	42	114,274	108,757	223,031	0.158	0.221	0.188
13	28	6	34	112,823	110,093	222,916	0.248	0.054	0.153
14	31	3	34	110,546	106,055	216,601	0.280	0.028	0.157
15	17	3	20	112,576	107,569	220,145	0.151	0.028	0.091
16	3	0	3	113,715	110,350	224,065	0.026	0.000	0.013
17	1	0	1	116,665	113,732	230,397	0.009	0.000	0.004
Total	113	62	175	1,260,164	1,207,353	2,467,517	0.090	0.051	0.071
Attack rate ^a							1.002	0.570	0.789

^a The attack rate is the sum of the annual incidence rates for every 1-year group.

To determine the monthly variation, the number of patients was recorded according to the month of onset of symptoms and diagnosis and the χ^2 -test was used to evaluate the variation (Bickel and Doksum 1977).

5 statistical tests for trend were performed to evaluate the difference that had occurred during the period 1946–1992. A p-value of < 0.05 was considered to be significant but, to avoid mass significance, all tests were made on a level of 0.05/5 (Bonferroni correction: p-value/number of tests). In the other tests, a p-value of < 0.05 without correction was considered to be significant.

Results

The average number $\pm$ SD (range) of patients with physiolyis of the hip diagnosed each year between 1946 and 1992 was 2.4 $\pm$ 1.8 (0–6) for boys, 1.3 $\pm$ 1.2 (0–5) for girls and 3.7 $\pm$ 2.0 (0–8) for both sexes. Over the entire period, the attack rate per thousand (range; 95% confidence intervals) was 1.002 (0.00–3.51; 0.81–1.28) for boys, 0.570 (0.00–2.26; 0.43–0.74) for girls and 0.789 (0.00–2.31; 0.68–0.95) for both sexes (Table 1). No significant changes in the rates during the period were found. The risk of developing physiolyis of the hip was 1:998 for boys, 1:1756 for girls and 1:1267 for both sexes.

The average age $\pm$ SD (range) at diagnosis was 13.1 $\pm$ 1.7 (7–17) years in the whole group. The boys were older, 13.6 $\pm$ 1.7 (7–17) years, than the girls, 12.1 $\pm$ 1.4 (8–15) years. The difference in age between boys and girls was significant (p < 0.001), but there was no significant difference in the age at diagnosis during the entire period. However, there was a tendency for the

age at diagnosis to decrease for boys, but not for girls. The average time $\pm$ SD (range) between the onset of symptoms and diagnosis was 3.6 $\pm$ 5.0 (0–36) months.

Of the 175 patients, 113 (65%) were boys and 62 (35%) were girls (p 0.0001). The boy:girl ratio was 1.8:1 for the whole period. The sex ratio for each year differed between 6:0 and 0:5, but there was no significant difference during the whole period.

The left hip was affected first in 104 (59%) of the 175 patients, the right hip in 69 (39%) and, in the remaining 2 (1%) patients, both hips were affected simultaneously (p 0.008). The left side dominance was more pronounced in boys (64%; p 0.002) than in girls (52%; p 0.7) over the whole period. No significant difference for the first affected hip during the period was found.

The onset of symptoms was most frequent in May and least frequent in October and November. The highest number of cases of physiolyis of the hip diagnosed during 1 month was in September and the lowest in February. The difference between the months in the onset of symptoms was not significant.

Discussion

The attack rate (i.e., the sum of the annual incidences in each 1-year group) is regarded by some authors as the most appropriate method for calculating the incidence of a disease such as physiolyis of the hip that occurs during a limited age range (Molloy and MacMahon 1966). This method takes account of the fact that physiolyis of the hip has a peak age and is less frequent in the younger and older age groups. The attack rate also gives the total risk of the popula-

tion developing the disease. This method has previously been used to calculate the incidence of Perthes' disease (Molloy and MacMahon 1966, Moberg and Rehnberg 1992).

In our study, the attack rate per thousand was 0.79 (1.00 for boys and 0.57 for girls). Our annual incidence per thousand was 0.07 (0.09 for boys and 0.05 for girls) in the population aged 7–17 years. Henrikson (1969) reported $0.02\text{--}0.13/10^3$ in Gothenburg/Sweden in the population aged 7–16 years, Kelsey et al. (1970) found $0.11/10^3$ in Connecticut/U.S.A. and $0.02/10^3$ in New Mexico in the population aged 10–17 years for boys and 8–15 for girls. Ninomiya et al. reported (1976) $0.002\text{--}0.003/10^3$ in Japan in the population aged 10–14 years. The difference in annual incidence found in our study compared with that reported by Henrikson (1969) and Kelsey et al. (1970) could be explained by different age intervals in the different populations. The risk of developing physiolyis of the hip has a peak, 14 years in boys and 12 years in girls, and is lower in the younger and older age groups. Using the attack rate method, the age range does not need to be defined and comparisons between different studies are therefore more accurate.

Hägglund et al. (1984) calculated the incidence of physiolyis of the hip as the number of patients born in a certain year, divided by the number of children born during the same year, and found that the incidence was $0.61/10^3$ for boys and $0.30/10^3$ for girls in southern Sweden. They assumed that the number of living children born in a certain year was almost the same as the number of these children during the actual age range and they maintained that the incidence in the population born in the same year gives the absolute and the most correct incidence values. The number of children during the relevant age period compared with children born in a certain year was only approximately 75% in our study. We were therefore not able to use the same method as Hägglund et al. (1984) and recommend the attack rate method for calculating the incidence of physiolyis of the hip.

The age at diagnosis in our study was somewhat lower than in the study conducted by Hägglund et al. (1984) but is in accordance with the study by Loder et al. (1990). Unlike Hägglund et al. (1984), we found no significant difference in the age at diagnosis between 1946 and 1992. However, we did find a tendency towards decreasing age at diagnosis for boys but not for girls. During the same period, the age of menarche decreased from 13.8 years in 1950 (Romanus 1952) to 12.8 years in the 80s (Lindgren et al. 1991). If the etiology of physiolyis of the hip is mainly hormonal, the age at diagnosis should

decrease more than we and Hägglund et al. (1984) found.

The male preponderance in our study (65%) is lower than in the study by Jerre (1950) who reported 83%, but in accordance with the 65–73% reported by others (Wilson et al. 1965, Henrikson 1969, Kelsey et al. 1970, Hägglund et al. 1984). Hägglund et al. (1984) found that the male preponderance decreased with time in children born between 1896 and 1949. In this study, there was no significant difference in the male preponderance between 1946 and 1992.

The left-side preponderance is in accordance with earlier investigations (Jerre 1950, Hall 1957, Hägglund et al. 1984). One possible explanation is that right-handed people put more weight on their left leg (Marsk 1958). Animal studies have shown that the physis is weakened during periods of rapid growth (Morscher et al. 1965). This indicates that one of the main factors behind physiolyis of the hip is mechanical.

Unlike Andrén and Borgström (1958) and Loder et al. (1990), we found no seasonal variations according to the month of onset of symptoms. This is in accordance with the investigations by Sörensen (1968) and Kelsey (1969). Hägglund et al. (1984) found a seasonal variation only for girls.

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