THE HERRING LATERAL PILLAR CLASSIFICATION FOR PROGNOSIS IN PERTHES DISEASE

LATE RESULTS IN 49 PATIENTS TREATED CONSERVATIVELY

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We reviewed the radiographs of 49 patients with Perthes' disease at the stage of fragmentation and also after the end of skeletal growth to assess the value of the lateral pillar classification of Herring. The average age of the patients at diagnosis was 7 years 6 months and the mean follow-up was 24 years.

Ten of the 11 Herring group-A hips showed good reconstruction of the femoral head. There were good results in group-B hips when the patients were less than nine years of age at diagnosis. All 11 group-C patients showed hip deformity at follow-up.

The Herring classification provides a valid long-term prognosis in Perthes' disease, although age at diagnosis is also an important prognostic factor. The classification is relatively easy to apply, is reliable, and requires only an anteroposterior radiograph taken during the fragmentation stage of the disease.

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Many papers have been published on the prognosis of Perthes' disease (Perpich, McBeath and Kruse 1983; McAndrew and Weinstein 1984; Ippolito, Tudisco and Farsetti 1985, 1987; Ritterbusch, Shantharam and Gelinas 1993).

In 1971, Catterall described a commonly used classifica-

tion, based on the amount of involvement of the proximal femoral epiphysis. In 1992, Herring et al proposed a new classification, made during the fragmentation stage, which placed hips into one of three groups based on the height of the lateral pillar of the femoral head.

We aimed to compare the final outcome after maturity in 49 conservatively treated patients with the result of the Herring classification of the height of the lateral pillar at the stage of fragmentation.

PATIENTS AND METHODS

In 1987 we published the long-term results in 61 patients with unilateral Perthes' disease treated at the Department of Orthopaedic Surgery of the University of Rome 'La Sapienza' (Ippolito et al 1987). We have now been able to evaluate the long-term clinical records and complete sets of radiographs of 49 of these 61 patients; some of the radiographs of the other 12 patients had been destroyed. There were 42 male and 7 female patients; the right hip was involved in 26 and the left in 23. The average age at diagnosis was 7 years 6 months (2 years 5 months to 14 years 6 months).

All the patients had been treated by a short period of traction in bed at the onset of the disease, then by a hip spica for one or two months non-weight-bearing, followed by the use of a hip spica fitted with a weight-relieving calliper. The average time of immobilisation in plaster was 23 months. At follow-up the average age was 30 years 2 months (21 to 61). Follow-up averaged 24 years (7 to 56).

Radiographs taken during the fragmentation stage of the disease were classified by the lateral pillar method of Herring et al (1992); those taken at skeletal maturity were classified as proposed by Stulberg, Cooperman and Wallenstein (1981).

The Herring classification. The classification of Herring et al (1992) divides the femoral head in an anteroposterior view into three groups during the fragmentation stage of the disease. The lateral pillar comprises 15% to 30% of the femoral head, the central pillar 50%, and the medial pillar 20% to 35% (Fig. 1).

In Herring group A, the height of the lateral pillar is radiographically normal as compared with the contralateral

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Fig. 1a

Fig. 1b

Fig. 1c

Fig. 1d

The Herring classification showing: a normal head (a); group A – the height of the lateral pillar is normal (b); group B – reduction to between 50% and 100% of the original height (c); group C – reduction to less than 50% (d).

Fig. 2a

Fig. 2b

Radiograph of an eight-year-old boy with left-sided Herring group-A Perthes' disease (a). At follow-up, aged 28 years, the affected hip was in Stulberg class 1 (b).

hip. In group B, the height of the lateral pillar is between 50% and 100% of the original height, and the central and medial pillars may also be decreased. In group C, the height of the lateral pillar is less than 50% of the original height.

Each of the five authors independently reviewed the radiographs for both Herring and Stulberg classifications on five occasions. Intraobserver agreement was 100% for both classifications. Interobserver agreement was 88% for the Herring and 98% for the Stulberg classification. The 12% disagreement for the Herring classification, however, fell to zero when the height of the lateral pillar was measured by ruler in each case.

The Herring classification of the radiographs at the fragmentation stage was made before review of the radiographs at long-term follow-up; the latest long-term radiographs were classified with knowledge of the earlier films, but we do not believe that this influenced the result of the usually reliable and repeatable Stulberg classification.

RESULTS

At the stage of fragmentation, 11 of the 49 affected hips were in group A, 27 in group B and 11 in group C

according to the Herring classification.

At follow-up, of the 11 hips classified as group A, ten were in Stulberg class 1 (Fig. 2) or 2 and one in class 3. At diagnosis the average age of these patients was 5 years 6 months (3 years 4 months to 9 years 6 months). The patient in class 3 was the oldest at diagnosis, being 9 years 6 months of age.

Of the 27 hips classified as group B, ten were Stulberg class 1 or 2, nine were class 3 (Fig. 3), seven class 4 and one class 5. All the patients with hips in Stulberg class 1 or 2 were under nine years of age at diagnosis. Seven of the nine class-3 hips were in patients over nine years of age at diagnosis. All the patients with hips in Stulberg class 4 and class 5 after maturity were over nine years of age at diagnosis.

Of the 11 hips classified as group C, six were in Stulberg class 3 and five in class 4 (Fig. 4). At diagnosis the average age was 7 years (3 years 8 months to 13 years 3 months).

DISCUSSION

The prognosis of Perthes' disease is well known to be related to the age at diagnosis and all long-term follow-up studies agree the inverse correlation between the age at

Fig. 3a

Fig. 3b

Radiograph of a nine-year-old boy with left-sided Herring group-B Perthes' disease (a). At follow-up, at 34 years of age, the affected hip was in Stulberg class 3, with early signs of osteoarthritis (b).

Fig. 4a

Fig. 4b

Radiograph of a six-year-old boy with right-sided Herring group-C Perthes' disease (a). At 50 years of age the affected hip was in Stulberg class 4, with definite signs of osteoarthritis (b).

onset and the degree of anatomical reconstruction of the femoral head (Eaton 1967; Catterall 1971; Mose et al 1977; Ratliff 1978; Salter 1980; Stulberg et al 1981; McAndrew and Weinstein 1984; Ippolito et al 1987). Our two previous investigations confirmed that better final results were obtained in the patients under five years at diagnosis, and worse in those older than nine years (Ippolito et al 1985, 1987). Another important prognostic factor is the proportion of the proximal femoral epiphysis involved radiographically (Catterall 1971; Salter and Thompson 1984).

The classification of Catterall (1971) is often difficult to apply; it requires extensive experience in paediatric orthopaedics (Christensen et al 1978; Hardcastle et al 1980; Tudisco, Farsetti and Ippolito 1988). The Herring classification, based only on the height of the lateral pillar during the fragmentation stage, is easier.

We found at the end of skeletal growth that all but one of our Herring group-A hips had very good anatomical reconstruction of the proximal femoral epiphysis (Stulberg class 1 and 2). The one exception, a patient 9 years and 6 months

old at diagnosis, had a mushroom deformity of the femoral head (Stulberg class 3). The 27 patients classified as Herring group B showed good final results (Stulberg class 1 and 2) only when their age at diagnosis was less than nine years, and all but two of the patients with Stulberg class-3, class-4 and class-5 hips were over nine years of age at diagnosis. All our Herring group-C hips showed deformities of the femoral head at follow-up (Stulberg class 3 and 4).

The height of the lateral pillar of the femoral head seems to provide a good prognostic indicator, but the age at diagnosis, especially in group-B patients, is also important although it does not always forecast the long-term outcome. The patient with the hip shown in Figure 2 was eight years old at diagnosis and regained perfect sphericity of the femoral head; the hip shown in Figure 4 was in a six-year-old, and at follow-up showed severe deformity of the proximal femoral epiphysis with marked signs of osteoarthritis of the hip. At the stage of fragmentation, the first hip had been in group A and the second in group C.

Conclusions. We found the Herring classification easy to apply, requiring only anteroposterior radiographs. It offers the additional advantage of being reproducible between observers, although we recommend the use of a ruler to define and measure the lateral pillar.

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REFERENCES

- Catterall A.** The natural history of Perthes' disease. *J Bone Joint Surg [Br]* 1971;53-B:37-53.
- Christensen F, Søballe K, Ejsted R, Luxhøj T.** The Catterall classification of Perthes' disease: an assessment of reliability. *J Bone Joint Surg [Br]* 1978;68-B:614-5.
- Eaton GO.** Long-term results of treatment in coxa plana: a follow-up study of eighty-eight patients. *J Bone Joint Surg [Am]* 1967;49-A:1031-42.
- Hardcastle PH, Ross R, Hamalainen M, Mata A.** Catterall grouping of Perthes' disease: an assessment of observer error and prognosis using the Catterall classification. *J Bone Joint Surg [Br]* 1980;62-B:428-31.
- Herring JA, Neustadt JB, Williams JJ, Early JS, Browne RH.** The lateral pillar classification of Legg-Calvé-Perthes disease. *J Pediatr Orthop* 1992;12:143-50.
- Ippolito E, Tudisco C, Farsetti P.** Long-term prognosis of Legg-Calvé-Perthes disease developing during adolescence. *J Pediatr Orthop* 1985;5:652-6.
- Ippolito E, Tudisco C, Farsetti P.** The long-term prognosis of unilateral Perthes' disease. *J Bone Joint Surg [Br]* 1987;69-B:243-50.
- McAndrew MP, Weinstein SL.** A long-term follow-up of Legg-Calvé-Perthes disease. *J Bone Joint Surg [Am]* 1984;66-A:860-9.
- Mose K, Hjorth L, Ulfeldt M, Christensen ER, Jensen A.** Legg-Calvé-Perthes disease: the late occurrence of coxarthrosis. *Acta Orthop Scand* 1977; Suppl 169.
- Perpich M, McBeath A, Kruse D.** Long-term follow-up of Perthes' disease treated with spica casts. *J Pediatr Orthop* 1983;3:160-5.
- Ratloff AHC.** Perthes' disease. Part II. The long-term results. In: Lloyd-Roberts GC, Ratloff AHC, eds. *Hip disorders in children*. London: Butterworths, 1978:150-64.
- Ritterbusch JF, Shantharam SS, Gelinis C.** Comparison of lateral pillar classification and Catterall classification of Legg-Calvé-Perthes disease. *J Pediatr Orthop* 1993;13:200-2.
- Salter RB.** Legg-Perthes disease: the scientific basis for the methods of treatments and their indications. *Clin Orthop* 1980;150:8-11.
- Salter RB, Thompson GH.** Legg-Calvé-Perthes disease: the prognostic significance of the subchondral fracture and the two-group classification of the femoral head involvement. *J Bone Joint Surg [Am]* 1984;66-A:479-89.
- Stulberg SD, Cooperman DR, Wallensten R.** The natural history of Legg-Calvé-Perthes disease. *J Bone Joint Surg [Am]* 1981;63-A:1095-1108.
- Tudisco C, Farsetti P, Ippolito E.** Malattia di Legg-Calvé-Perthes, Considerazioni eziopatogenetiche in base ad osservazioni cliniche e radiografiche: analisi di 100 casi. *Ital J Orthop Traum Pediatr* 1988;2:187-91.