The irritable hip

Scintigraphy in 192 children

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Over a 4-year period, 192 patients with a typical transient synovitis syndrome underwent radionuclide scintigraphy shortly after presentation. Three different patterns were found suggesting that all the cases may not be of the same etiology. Fifteen patients had evidence of ischemia of the femoral head, but only 4 patients went on to develop the typical radiographic features of Perthes' disease. The other 11 patients are thought to represent a minor, radiographically silent form of Perthes' disease.

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Bohr (1973) first described the use of skeletal scintigraphy in the investigation of Perthes' disease. It is now well established, and changes can be seen earlier than on plain radiographs (Calver et al. 1981). Recently, several reports have included patients in whom ischemia of the femoral epiphysis was not followed by radiographic evidence of osteonecrosis (Wingstrand 1986, Hasegawa et al. 1988). As a result, the uncertainty of the relationship between Perthes' disease and the irritable hip syndrome has persisted (Spock 1959, Kallio, 1986).

It has been the policy of the senior author (CSBG) that all irritable hips undergo radionuclide skeletal scintigraphy shortly after admission. To try to clarify the above question, we have reviewed our findings over a 4-year period.

Patients and methods

Between June 1986 and May 1990, all the patients admitted with a significantly irritable hip have undergone conventional ^{99m}Tc-MDP scintigraphy usually within 7 days of presentation. The patients that were included met the following criteria:

1) Spontaneous onset of hip pain and/or limp.
2) Restricted movement of hip with or without muscle spasm.
3) Apyrexial, normal white cell count and ESR.
4) Failure to settle with 48 hours' bed rest.
5) Normal AP and lateral radiographs of the hip.

During the 4-year period, 192 children met these criteria. Of these, 130 were boys. The mean age was 6 (1–15) years.

The scintigrams were performed in a standard manner, including both immediate blood-pool images and delayed static images at 3–4 hours postinjection. The dose (MBq) of technetium isotope used was calculated according to the body weight in the following formula:

$$\frac{(\text{Body wt.})^{2/3}}{(70)} \times 550 \text{ MBq}$$

The pinhole collimator scintigrams of both hip joints were analyzed both visually and digitally. Digital analysis of these images was performed by taking a transverse section across the scintigram that is sufficiently wide to incorporate both the acetabulum superiorly and the proximal femoral epiphysis inferiorly. The amount of isotope within this transverse slice was then shown graphically.

Fourteen children re-presented during the review period with sufficient symptoms to warrant a further scintigram. One child had three and another four scintigrams. All the children were subsequently reviewed until asymptomatic, or for at least 12 months in the patients with reduced uptake in the femoral head.

Results

The initial blood-pool images were not found to be useful, and therefore they were not analyzed further.

The primary static scintigraphic findings, taken 3 to 4 hours after injection, fell into three groups:

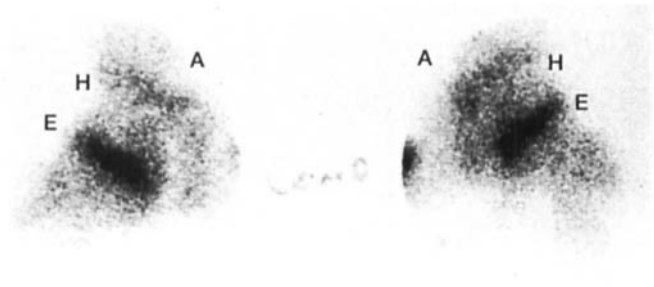
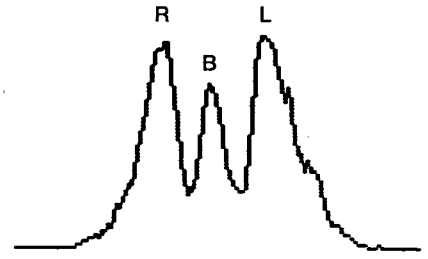


Figure 1. Normal scintigram showing physiologically increased uptake in the femoral epiphysis (E) and acetabulum (A), and a lower, uniform uptake in the femoral head (H).



Scintimetry normal with equal peaks from the left (L) and right (R) hips. The central peak (B) represents isotope accumulated within the bladder.

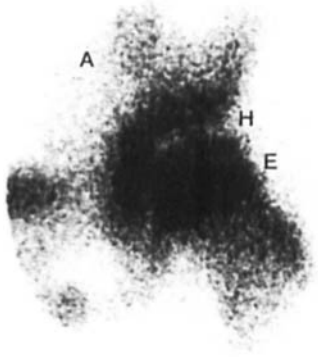
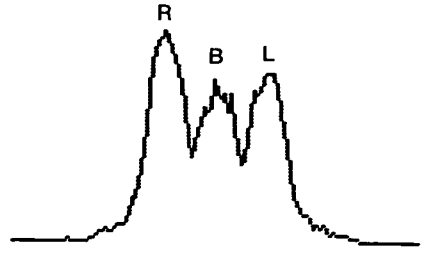


Figure 2. Scintigram of the left hip showing a generalized increased uptake of the acetabulum (A), femoral head (H), and femoral epiphysis (E).



Scintimetry shows increased uptake of the right hip (L) compared with the left hip (R). Bladder (B).

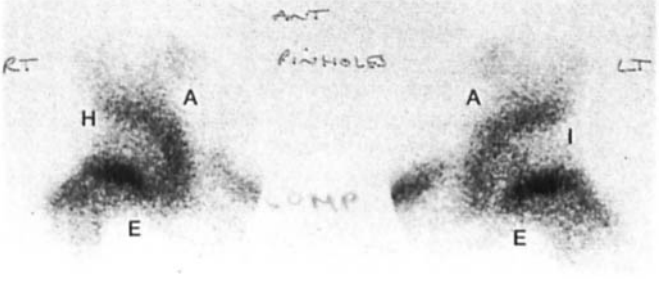
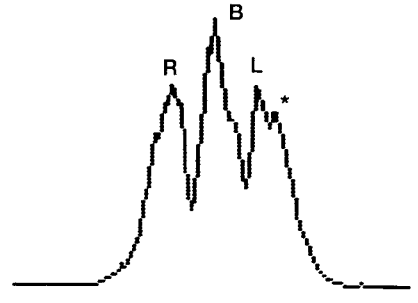


Figure 3. Scintigram showing reduced uptake in the lateral part of the left femoral head (I), with normal uptake in the acetabulum (A), in the femoral epiphysis (E), and in the right femoral head (H).



Scintimetry shows reduced uptake of the left hip (L) with a step (*) in the curve, which is not present on the right (R). Bladder (B).

Normal appearances (n 130). These showed a normal increased uptake associated with the proximal femoral physis; a lesser area of increased isotope from the roof of the acetabulum; and a low, but uniform uptake from the femoral head (Figure 1). When these films were digitally analyzed, the left and right hip joints had equal uptake.

Generalized increased uptake (n 47). The pinhole collimator views showed a generalized increased uptake on both sides of the hip joint including the

Table 1. Recurrent irritable hips

Case	Age	Sex	First scintigram	Interval (mo)	Second scintigram	Clinical outcome
1	9	F	–	27	–	1
2	6	M	–	7	–	1
3	11	M	–	6	–	1
4	6	M	–	4	+	1
5	8	M	–	3	+	1
6	7	F	+	15	–	1
7	7	M	+	5	+	1
8	8	M	+	25	+	1
9	14	M	+	6	[a]	1
10	8	M	+	3	–	2, 1
11	5	M	–	14	–	3, 1

Scintigram: – normal, + increased uptake, [a]reduced uptake. Clinical outcome: 1 full recovery, 2 further relapse at 6 months (normal scintigram), 3 two further episodes at 4 and 14 months (normal scintigrams).

acetabulum, femoral head, and physis (Figure 2). When digitally analyzed, there was an increased uptake in the affected hip.

Reduced uptake in the lateral femoral head (n 15). On pinhole collimator films, an area of reduced uptake in the lateral part of the femoral head was identified (Figure 3), and this corresponded to an irregularity in the graph generated by the digital analysis, with a small step on the affected side.

Of the 177 children with normal or increased uptake, 166 made uneventful recoveries with resolution of pain and limp, usually within 10 to 14 days. These children were reviewed at about 6 weeks from discharge, had remained painfree, and have had no subsequent referrals to our hospital. The other 11 children suffered relapses of their irritable hips sufficient to warrant further scintigraphy (Table 1). One child (Case 9) developed diminished uptake of the femoral head, having 6 months previously shown an increased uptake. Two children (Cases 10 and 11) had more than two scans because of recurrent symptoms, but both made a full recovery.

The 15 children with reduced uptake were reviewed for at least 12 months; in 4, radiographically detectable Perthes' disease developed. One child showed persistent diminished femoral head uptake on a second scintigram 3 months later, but made a full recovery with normal radiographs. Another child had a normal scintigram at 17 months during a relapse of symptoms and subsequently made an uneventful recovery. One of the 4 children who developed established Perthes' disease had a second scintigram to determine the degree of femoral head involvement. The group with reduced uptake also contained 2 children with leukemia who were receiving chemotherapy.

Discussion

The cause of the irritable hip syndrome has never been clearly established; infection has been postulated but not proven (Hardinge 1970). There appears to be an increased chance of recurrence of an irritable hip, approaching 20 times the original risk (Landin et al. 1987).

Most large series have found that a small number (around 1 to 3 percent) of these cases eventually progress to fully established Perthes' disease (Spock 1959, Landin et al. 1987), but this is not universal (Kallio et al. 1986). Kemp (1973) suggested an etiologic link between the irritable hip syndrome and Perthes' disease after he found experimentally that a raised pressure within the hip capsule, such as may occur with an effusion or hemarthrosis, could occlude the blood supply to the femoral head. The period for this to occur may be as short as 2 hours if the raised pressure is in excess of the arterial pressure (Verger and Lubsen 1987).

Because of this interruption of the blood supply to the femoral head, radionuclide skeletal scintigraphy is a useful way of assessing the prognosis of Perthes' disease (Fisher et al. 1980), as well as allowing early diagnosis (Calver et al. 1981). By using both pinhole collimator images as well as digital recording and plotting of the uptake from the hip joints, good quality films and accurate interpretation can readily be achieved (Wingstrand 1986).

From our series, it has been found that the irritable hip syndrome presents with three different scintigraphic images. It previously has been noted by several authors that in normal scintigrams diffuse uptake and areas of ischemia may occur in what appears to be a single clinical syndrome (Wingstrand et al. 1985, Sutherland et al. 1980).

These findings suggest that the irritable hip is not due to a single pathology. First, there may be an inflammatory process around the hip, reflected by a diffuse increase in uptake on scintigraphy, a so-called transient synovitis. Secondly, there is a group of patients in whom no changes occur on the radionuclide scintigram; and thirdly, the irritable hip may represent an early form of Perthes' disease, which is likely to remain radiographically silent on conventional radiographs in about three quarters of the patients, but is readily apparent on radionuclide skeletal scintigraphy.

Perthes' disease has classically been described on the basis of its radiographic changes (Catterall 1971), but the advent of skeletal scintigraphy has added another dimension to the disease. Our results support previous suggestions that a new category be added to the conventional classification of Perthes' disease to include patients with ischemic changes on their

scintigram but normal radiographs, Grade 0. This concept is supported by the finding that the morphology of Perthes' disease ranges from ischemic arrest of ossification to complete infarction, often occurring in repeated episodes (Catterall et al. 1982).

Recently introduced, magnetic resonance imaging, with its excellent resolution of changes in blood supply and water content, will probably supersede skeletal scintigraphy; but no results have been published yet, and this imaging technique is not yet widely available in this country.

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