

From the Orthopaedic Clinic (Head: Sophus von Rosen, M.D.),  
Malmö General Hospital, University of Lund, Malmö, Sweden.

## LATE RESULTS OF PERTHES' DISEASE

By

LARS G. DANIELSSON and JERKER HERNBORG

This paper is concerned with an investigation of the late clinical and radiological results of Perthes' disease.

### MATERIAL

The material consisted of 40 patients with Perthes' disease. The diagnosis was radiologically verified in all cases. Two patients had in the meantime emigrated, 2 had died and one could not be traced. The remaining 35 patients (28 men and 7 women) were after-examined clinically and radiologically (Table 1). The interval between the onset of the disease and the present after-examination was at least 20 years; on the average, 33 years (32 for men and 37 for women).

The disease was right-sided in 22 cases and left-sided in 13. The average age at onset was 7.4 years (7.7 in the men and 6.0 in the women). The lowest age at onset was 3 years; the highest, 13 years.

All patients except 2 had been treated with bed-rest. The average duration was 6.1 months. In 23 cases (19 men and 4 women) the hip was immobilised in plaster for an average period of 3.2 months. Except in 2 cases treatment included freedom from weight-bearing (plaster, bed-rest, crutches) for, on the average, 6.6 months.

### METHODS


















The patients were after-examined clinically and radiologically in 1964. Thirteen of the patients had also been examined radiologically in 1949-1955. The clinical examination included evaluation of pain, range of motion and restriction of function (Danielsson 1964). Radiological evaluation<sup>1</sup> was performed on frontal, lateral and Lauenstein views. The degree of arthrosis was assessed according to Heripret's schema (Danielsson *et al.* 1964). The series was divided into 4 groups according to degree of deformity of the femoral head. Lowest degrees of deformity in the different groups 1, 2 and 3 are illustrated in Figs. 1, 2 and 3. The length of the caput-collum was measured, after which the ratios between the values of the hip joint without and with Perthes' disease were calculated.

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The investigation was supported by grants from *Ulla and Gustaf af Uggle's Foundation*, Stockholm.



















<sup>1</sup> Radiographs interpreted in cooperation with Dr. B. Frost.

TABLE 1  
Total Material.

Case	Sex	Age at onset of pain	Interval between onset and after-examination (years)	Bed rest (months)	Immobilisation in plaster (months)	Freedom from weight-bearing (months)	Complete freedom from pain after initial stage	Severity of pain	Range of motion	Restriction of function	Radiological severity	Degree of deformity	
1	F	06	31	14	00	14	×	0 0	70 82	02	0000 0000	2	
2*	F	04	42	06	06	06	×	0 0	21 48	06	3221 2010	3	
3	M	12	42	07	07	07		0 0	38 70	01	2230 1000	3	
4	F	11	42	06	03	06	×	0 0	82 43	01	0000 2121	3	
5	M	11	48	02	01	02		0 1	74 57	03	0000 1020	3	
6	M	04	35	03	00	03		0 0	84 84	03	0000 0000	0	
7	M	05	35	03	02	03	×	0 0	82 82	00	0000 0000	1	
8	M	13	22	07	00	12		0 0	59 82	01	1010 0000	2	
9	F	05	39	06	06	06		0 0	86 80	01	0000 0000	2	
10	M	08	46	09	09	09		3 0	58 78	02	3121 1000	3	
11	F	07	33	00	00	00	×	0 0	82 86	02	0000 0000	1	
12	F	03	44	06	00	06	×	0 0	88 94	01	0000 0000	1	
13	M	05	30	04	04	04	×	0 0	83 83	01	0000 0000	0	
14	M	10	44	04	03	04		2 0	53 79	03	2211 0000	3	
15	M	08	37	04	03	04	×	0 0	82 82	02	0010 0000	1	
16	M	08	25	11	11	11		0 0	90 90	01	0000 0000	1	
17	M	05	28	09	09	09	×	0 0	87 86	01	1000 0000	1	

\* Right-sided subluxation.

TABLE 1 (cont.)

Case	Sex	Age at onset of pain	Interval between onset and after-examination (years)	Bed rest (months)	Immobilisation in plaster (months)	Freedom from weight-bearing (months)	Complete freedom from pain after initial stage	Severity of pain	Range of motion	Restriction of function	Radiological severity	Degree of deformity	
18	M	11	45	10	07	10	×	0 0	70 75	02	1010 0000	3	
19	M	04	22	01	00	01	×	0 0	86 86	03	0000 0000	0	
20	M	08	29	05	03	05		0 2	85 24	03	0000 0010	3	
21	M	07	31	03	03	06	×	0 0	70 85	02	0000 0000	2	
22	M	07	35	03	01	04	×	0 0	66 71	01	1010 0000	2	
23	M	07	20	02	00	03	×	0 0	81 81	01	0000 0000	0	
24	M	10	20	12	00	18	×	0 0	76 83	01	1000 0000	2	
25	M	07	22	08	08	08	×	0 0	92 92	01	0000 1010	1	
26	M	10	22	15	00	15		0 0	65 85	01	2010 0000	2	
27	M	09	26	00	00	00	×	0 0	68 82	01	0000 0000	3	
28	M	06	23	17	00	19	×	0 0	91 91	01	0000 0000	0	
29	M	10	22	08	00	08		0 0	82 86	01	2010 0000	2	
30	M	05	56	06	06	07		5 0	36 74	12	1211 0000	3	
31	M	09	29	04	04	04	×	0 0	78 65	02	0000 1000	3	
32	F	07	29	06	06	06	×	0 0	84 90	01	0000 0000	1	
33	M	11	36	03	03	03		0 2	80 62	04	0000 3231	3	
34	M	07	36	05	04	05		1 0	29 82	04	3221 1000	3	
35	M	04	41	04	03	04	×	0 0	87 88	02	0000 0000	0	

*Fig. 1.*

(Case 16). Male, aged 33. Right-sided Perthes' disease at 8 years. Hip painless. Range of motion normal (90). No restriction of function (01). Deformity of the head classified as 1. No arthrosis.

*Fig. 2.*

(Case 24). Male, aged 31. Right-sided Perthes' disease at 10 years. Hip painless. Range of motion excellent (76). No restriction of function (01). Deformity of the head classified as 2. No arthrosis.

*Fig. 3.*

(Case 03). Male, aged 54. Right-sided Perthes' disease at 12 years. Hip painless. Range of motion good (38). No restriction of function (01). Deformity of the head classified as 3. Arthrosis (07).

## RESULTS

### *Pain.*

Pain at onset had been localised to the following sites: greater trochanter in 13, groin in 5 and knee joint in 3. The corresponding figures at the after-examination were 7, 3 and 2.

Two patients reported starting pain, 2 spontaneous pain during rest, 2 pain after exercise (disappeared during rest), one severe pain when walking, and 5 slight pain when walking. Fourteen patients (all men) reported that they had on one or more occasions had hip pain. At after-examination 7 patients (all men) complained of pain (Fig. 4), while 28 (21 men and 7 women) were free from pain.

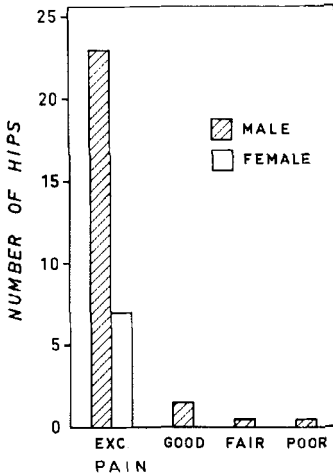


Fig. 4.

Number of hips classified according to severity of pain and patient's sex.

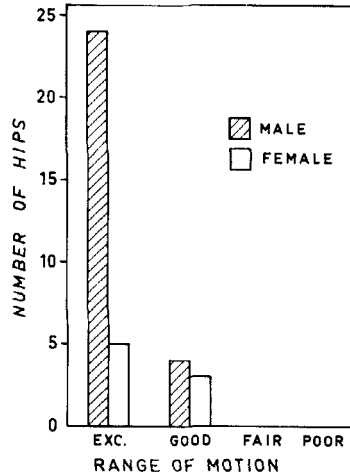


Fig. 5.

Number of hips classified according to range of motion and patient's sex.

### Range of Motion.

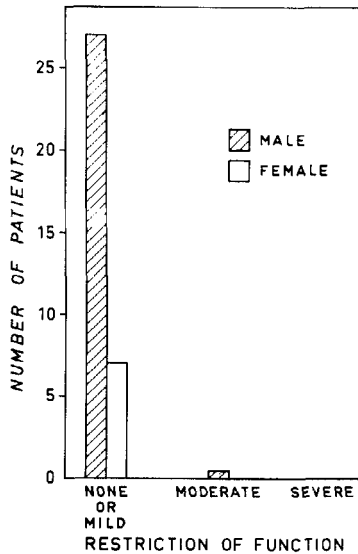
Nine patients (all men) had "normal" range of motion of the hip. All patients had "excellent" or "good" range of motion (Fig. 5). The mean index of range of motion for the hips with Perthes' disease was  $69 \pm 3.2$  and for the contra-lateral side  $83 \pm 0.8$ .

### Contracture.

Contractures were noted in all together 6 patients (4 men and 2 women). *Contracture in flexion*  $1-15^\circ$  was noted in one man and one woman,  $16-30^\circ$  in 2 men and one woman. Two men had *contracture in adduction*  $1-15^\circ$ . *Contracture in external rotation*  $1-15^\circ$  was recorded in one woman,  $16-30^\circ$  in one man and one woman, and  $31-45^\circ$  in one man.

### Restriction of Function.

All except 3 (men) could walk more than 1500 meters without hip pain. Of these, one complained of pain after 400-1500 meters and 2 after 100-400 meters. One man and one woman could not tie up their shoe-laces. One man had to use the handrail when walking upstairs; all the others could walk upstairs without support. No patients reported any difficulties with the use of the toilet. One man could not take a



*Fig. 6.*

Number of patients classified according to restriction of function and sex.

bath and one woman found it difficult. One man had a positive Trendelenburg test. One man had a severe limp, while 5 men and 2 women had a slight limp. Restriction of function was inconsiderable (Fig. 6) and the index was on the average  $2.1 \pm 0.34$ . (Restriction of function "None or Mild" for values 0-6).

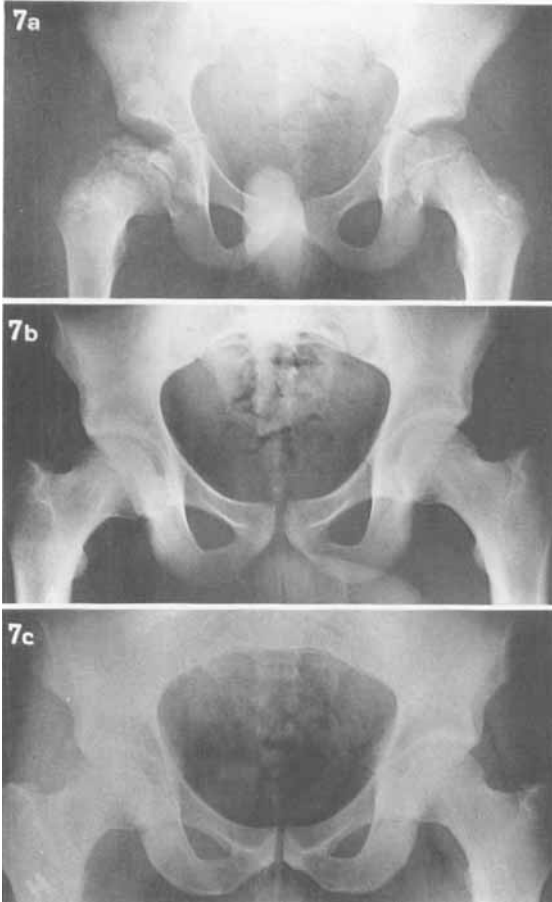
Shortness of the leg ( $\geq 1$  cm: anterior superior iliac spine—medial malleolus) was noted in 15 patients (13 men and 2 women). Atrophy of the thigh ( $\geq 1$  cm) was recorded in 22 patients (19 men and 3 women).

#### *Radiological Changes.*

The degree of deformity was judged as severe in 13 cases, as moderate in 8, as slight in 8 and in 6 no deformity of the femoral head was noted (Fig. 7).

Arthrotic changes (structural changes and/or narrowing of the joint space) were demonstrated in 17 hips (15 men and 2 women). Of these, structural changes alone were seen in 10 and in combination with narrowing of the joint space in 7. In 8 the joint space seemed to be wider on the affected side (Fig. 2).

Of the 13 patients examined radiologically 1949-1955 the arthrotic changes had progressed in 6, while in 7 the roentgen appearance was largely the same in 1964.



*Fig. 7.*  
 (Case 28). Male, aged 29.  
 Right-sided Perthes' disease  
 at 6 years (a), 1955, (b):  
 No deformity of the head.  
 No arthrosis. 1964, (c): No  
 pain. Range of motion nor-  
 mal (91). No restriction of  
 function (01). No deformity  
 of the head. No arthrosis.

### *Comparisons.*

*Age at onset* of Perthes' disease appeared to influence the clinical and radiological picture at the after-examination. It is clear from Table 2 that pain, decreased range of motion and restriction of function as well as arthrotic changes and deformity of the femoral head tended to be more common and more severe among those in whom the onset was late than early.

*The interval between the onset of the disease and the after-examination* also influenced the clinical and radiological picture. Table 3 shows that pain, decreased range of motion, restriction of function and arthrotic changes tended to be more common among those with a long interval since onset of the disease.

TABLE 2

*Cases Classified According to Age at Onset of Perthes' Disease and Severity of Pain, Range of Motion, Restriction of Function, Radiological Severity and Deformity of the Head.*

Age at onset	Pain		Range of motion		Restriction of function		Radiological severity		Deformity	
	0	≥	≥70	<70	<4	≥4	<3	≥3	<2	≥2
<8	17	2	15	4	18	1	16	3	12	7
≥8	11	5	5	11	13	3	8	8	2	14

TABLE 3

*Cases Classified According to the Interval Since Onset of Perthes' Disease and Severity of Pain, Range of Motion, Restriction of Function and Radiological Severity.*

Interval (years)	Pain		Range of motion		Restriction of function		Radiological severity	
	0	≥1	≥70	<70	<4	>4	<3	≥3
<30	13	1	9	5	14	0	12	2
≥30	15	6	11	10	17	4	12	9

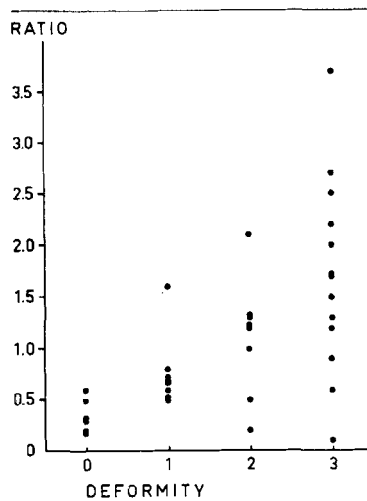


Fig. 8.

Deformity classified according to head-neck-length ratio.

TABLE 4

*Cases Classified According to the Deformity of the Head and Severity of Pain, Range of Motion, Restriction of Function and Radiological Severity.*

Deformity	Pain		Range of motion		Restriction of function		Radiological severity	
	0	≥1	≥70	<70	<4	≥4	<3	≥3
<2	14	0	14	0	14	0	14	0
≥2	14	7	6	15	17	4	10	11

TABLE 5

*Cases Classified According to Radiological Severity and Severity of Pain, Range of Motion and Restriction of Function.*

Radiological severity	Pain		Range of motion		Restriction of function	
	0	≥1	≥70	<70	<4	≥4
<3	26	2	20	8	27	4
≥8	2	5	0	7	1	3

TABLE 6

*Comparison between Patients with Perthes' Disease and Primary Coxarthrosis, Classified According to Age, Severity of Pain, Restriction of Function and Radiological Severity.*

	Age	Severity of pain	Restriction of function	Radiological severity
Perthes' disease	0.5 ± 0.01	69 ± 3.2	2.1 ± 0.34	2.1 ± 0.46
Primary coxarthrosis	2.3 ± 0.07	36 ± 2.4	10.0 ± 0.61	6.4 ± 0.13

(Danielsson 1964)

A correlation was found between the head-neck-length ratio and the deformity of the femoral head (Fig. 8).

*Deformity of the femoral head* also had an unfavourable effect on the clinical and radiological picture (Table 4). Pain, decreased range of motion, restriction of function and arthrotic changes tended to be more common among those with severe than among those with slight deformity of the femoral head.

*The severity of arthrosis* influenced the clinical picture. Table 5 shows that the number of patients with pain, decreased range of motion and restriction of function tended to be larger in the group with the

most severe arthrotic changes. It was also found that of the 10 patients with structural changes alone, only 2 had pain and an average range of motion of  $68 \pm 4.6$ , while of those 7 patients with both structural changes and narrowed joint space, all except 2 had pain and an average index of range of motion of  $46 \pm 4.7$ .

Pain tended to vary with *contracture*. Of the 6 patients with contracture 4 had or had had hip pain.

In this series no correlation was found between *the type of treatment given* and the clinical or radiological status at the time of the after-examination, nor between *overweight* and pain.

#### DISCUSSION

*Sundt* (1949) found at after-examination of 137 cases with a history of more than 10 years that the results were better in patients in whom the disease had appeared early in life. *Ratliff* (1956) and *Mose* (1964) arrived at the same conclusion on the basis of series of 50 and 219 patients, respectively. The results noted in the present investigation corroborate those reported by *Sundt*, *Ratliff* and *Mose*.

*Sundt* (1949) found the roentgen appearance of the hip to be normal in 11 of 153 cases with Perthes' disease for more than 10 years and *Helbo* (1953) in 4 of 41 patients for more than 25 years. The corresponding figures in the present material was 6 of 35.

*Sundt* (1949) found in his material arthrosis in 47 of 96 cases with a history of more than 20 years. In the present investigation structural changes and/or narrowing of the joint space were noted in 17 of 35 cases.

The clinical and radiological pictures were good, and better than those found in a series of primary coxarthrosis (*Danielsson* 1964). It is difficult to judge to what extent this may be ascribable to the higher age of the patients in the latter series (Table 6).

As to the correlation between age at onset of Perthes' disease, interval between onset and after-examination and clinical and radiological picture, the series is too small to allow any definite conclusions. However, arthrosis tended to be more advanced and more common among those with a late onset, with a long interval, or with a high degree of deformity.

#### SUMMARY

35 patients with Perthes' disease were after-examined clinically and radiologically, on the average 33 years after the onset of the disease.

In 28 patients the hips were painless. The index of range of motion of the hip was decreased in all except 9, but in all cases the results were excellent or good. Restriction of function was none or mild in all cases except one, where the restriction was moderate. In 6 cases no deformity of the femoral head could be observed. Structural changes and/or narrowing of the joint space were noted in 17 cases. In half of the cases the arthrotic changes had advanced radiologically during a 10-year period. High age at onset, long interval between onset and after-examination and severe deformity appeared to favour arthrosis.

#### RESUME

35 malades souffrant de la maladie de Perthe ont été réexaminés cliniquement et radiologiquement au bout d'une durée moyenne de 33 ans après l'apparition de la maladie. Chez 28 malades, les hanches étaient sans douleur. L'indice de l'étendue du mouvement de la hanche avait diminué chez tous excepté chez 9, mais dans tous les cas les résultats étaient excellents ou bons. Une réduction de la fonction était nulle ou bénigne dans tous les cas excepté un où la réduction était modérée. Dans 6 cas, aucune déformité de la tête fémorale n'a pu être observée. Des modifications structurales et/ou un rapprochement de l'espace de l'articulation a été noté dans 17 cas. Dans la moitié des cas, les modifications arthrotiques avaient progressé radiologiquement durant une période de 10 ans. Un âge avancé au moment du début de la maladie, un long intervalle entre l'apparition de la maladie et le réexamen et des déformités graves semblent favoriser l'arthrose.

#### ZUSAMMENFASSUNG

35 Patienten mit Perthes Erkrankung wurden klinisch und röntgenologisch durchschnittlich 33 Jahre nach dem Beginn der Erkrankung nachuntersucht. 28 Patienten hatte eine schmerzlose Hüfte. Der Index des Bewegungsausmasses des Hüfte war mit Ausnahme von 9 in allen Fällen herabgesetzt, aber in allen Fällen was das Ergebnis ausgezeichnet oder gut. Funktionseinschränkung war nicht vorhanden oder gering in allen Fällen mit Ausnahme von einem wo die Einschränkung moderat war. In 6 Fällen konnte keine Verbildung des Femurkopfes beobachtet werden. Strukturveränderungen und/oder Verschmälerung des Gelenkraumes wurden in 17 Fällen bemerkt. In der Hälfte der Fälle waren die arthrotischen Veränderungen röntgenologisch während einer 10 Jahrs-

periode fortgeschritten. Hohes Alter beim Beginn, langer Zeitraum zwischen Beginn und Nachuntersuchung und schwere Verbildung schienen die Arthrose zu begünstigen.

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