FROM "SAMFUNDET OG HJEMMET FOR VANFØRE", ORTHOPEDIC HOSPITAL, AARHUS, (CHIEF: P. G. K. BENTZON, M.D.), AND FROM SLOMANN & BENTZON'S ORTHOPEDIC CLINIC, COPENHAGEN

EPIPHYSIOLYSIS CAPITIS FEMORIS (COXA VARA EPIPHYSAREA), WITH SPECIAL REFERENCE TO BLOODLESS REPOSITION TREATMENT

BY

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For half a century, since 1888 when *E. Müller* (29) published his studies on 4 patients suffering from "Schenkelhalsverbiegung jugendlicher", the definition of this lesion, its etiology, pathogenesis, prognosis and treatment have been subjects of much discussion, at times very heated. Even though the first of these points has now been settled fairly well, the others—in particular, the treatment—are still being discussed ardently.

A detailed historical review of the question would fall outside the scope of this paper. Still, in passing, it is to be mentioned that in 1894 *Hofmeister* (16) and *Kocker* (24) independently of each other suggested the name "coxa vara" for the lesion described by *E. Müller*—unfortunately, on widely different grounds. *Hofmeister* attached the chief importance to the reduction of the collodiaphyseal angle, while *Kocker* ascribed the greatest significance to the deflection in the epiphyseal region and the resulting characteristic reduction in the mobility of the hip-joint. This difference in definition led to the establishment of "coxa vara" as an anatomical term (diminished collodiaphyseal angle) and also as a clinical concept or, rather, a number of clinical concepts that were not very much related to each other—for instance: *coxa vara adolescentium* corresponding to the clinical condition described by *Müller* and *Kocker*, *congenital coxa vara*, *rachitic coxa vara*, etc.

In 1898 *Sprengel* (33) demonstrated that the deformity which was considered characteristic of coxa vara adolescentium might develop as a sequela of slipping epiphysis; for this reason he suggested the name "coxa vara traumatica". Since then, the question about the significance of traumatic injury as an etiological factor in the development of this lesion has been estimated most differently. Constitutional anomalies and endocrine disturbances are rather common in these patients, and are assumed to cause some impairment of the zone of growth. Lately, the lesion has been attributed in part to nutritional deficiency (vitamins and minerals).

It is recognized generally that the etiology is obscure, none of the theories advanced so far being fully satisfactory. Still, it may be considered most likely that there is a primary affection of the zone of growth, so that the juxta-epiphyseal part of the diaphysis is impaired. When this impairment reaches a certain degree, the capital epiphysis will be able to slip under physiological conditions, or even at rest in bed. Before the impairment has progressed so far, a traumatic injury, slight or severe, may promote the slipping. It is reasonable to assume, therefore, that all sorts of transitions may occur between spontaneous slipping (separation) of the epiphysis and an entirely traumatic fracture on the epiphyseal line. The latter condition is not to be reckoned as slipping epiphysis in the stricter sense of the term; it may be reckoned as a fracture. Here it is again unfortunate that "epiphysiolysis" is used to designate fractures along epiphyseal lines as well as slipping epiphysis due to other causes. *Kienbøck* (22) has suggested to designate the lesion *malacia colli femoris juvenilis hypophysarea;* this is a new attempt at an etiological designation, but it probably implies a greater knowledge of the lesion than we possess.

The disease attacks the patients at an age of 10—18 years, the maximum frequency at 13—14 years, a little lower for girls than for boys. It is distinctly more frequent among boys.

As to the symptomatology, it will suffice here to mention that reduction in inward rotation, with increase in outward rotation, is a very early symptom, corresponding to the fact that

in mild cases the slipping of the epiphysis primarily has a backward direction. With greater degrees of slipping we have the classical picture: outward rotation in the hip and reduction in inward rotation, abduction and flexion, with free or increased mobility in the opposite directions of movement. In most cases, however, muscle spasms will inhibit the mobility far beyond the degree conditioned by the slipping.

Naturally the changing ideas about the nature of the lesion has had a decisive influence upon the treatment.

The first cases reported in the literature were all submitted to operation under the diagnosis "coxitis". This fact tells us in what group coxa vara adolescentium was classified before it was recognized as a disease *per se*. Therefore, the operative treatment was resection—subtrochanteric at that. Later on, when the lesion was looked upon as a bending of the neck of the femur, wedgeforming osteotomy (*Kraske* (25)) or linear osteotomy (*Büdinger* (6)) was performed on the neck. The results of resection as well as osteotomies were poor, however, and conservative methods as extension and bandaging were employed more and more, in particular after *Hofmeister* (17) in 1898 had shown that improvement resulted most often merely from sparing use of the extremity.

About 1909 *Drehmann* (9) and *Lorenz* (26) conceived the idea, almost at the same time, to perform reposition of the slipped epiphysis. The idea of reposing the separated epiphysis was obvious indeed, and the method was adopted widely with great expectations. In 1911, however, *Drehmann* (10) had to advise against an excessive use of physical force, as some cases were reported in which the treatment caused fracture of the femur.

Gradually, with increasing experience in the manipulation treatment, the results were found not to be so good as expected at first. Reposition did not succeed in every instance; furthermore, there appeared not infrequently some severe secondary changes leading to arthritis deformans or osseous ankylosis. This brought discredit on the method in many clinics.

In 1930 *Bentzon* (3) reported some cases of successful re-

position, and he therefore is of opinion that this treatment should not be given up. It is the results of the further employment of this treatment that will be reported here.

The purpose of the reposition treatment is to restore the natural position of the capital epiphysis and the neck. In order to obtain this the position of the femur in the hip-joint is adjusted under anæsthesia, placing the lower extremity in a position of inward rotation, abduction and slight flexion. This is easily done if the capital epiphysis is separated entirely; but in some cases it requires a rather considerable exertion of force to obtain such a change in the position. In other cases this is not practicable because the fixation is too strong.

In recent years several authors have warned against this method. In 1927, for instance, *Mau* (27) called attention to obvious misinterpretation of roentgenograms of the hip region. He made an experiment with roentgenography of a hip-joint in which the capital epiphysis was fixed after slipping, in relation to the neck. The plates were taken partly with the hip in normal position, partly in inward rotation and, finally, in forced inward rotation. By this, the slipped capital epiphysis was projected in such a manner that the plates in inward rotation showed "reposition", and "overcorrection" in forced inward rotation, although the position of the capital epiphysis in relation to the neck of the femur kept unchanged. *Mau* undoubtedly is right in claiming that such misinterpretation has taken place, but he may hardly be right in concluding that reposition is unobtainable. *Nikolajsen* (30) has reported some cases of reposition in which the roentgenograms were taken in projections that exclude misinterpretation. *Waldenström* (36) and *Camitz* (7) discard the manipulation treatment as not being useful, but especially, because they think it is even directly injurious. *Waldenström* states that the appearance of necrosis in the cartilage is due to the manipulation treatment, as he has observed no necrosis of cartilage after extension treatment. In order to verify whether this standpoint is correct, it is essential, for one thing, to try to elucidate the question: How is the prognosis of epiphysiolysis capitis femoris?

The question is difficult to answer, because the lesion is sufficiently uncommon to keep the individual author from seeing any considerable number of cases. On the other hand, in the course of time so many studies have been published on this lesion that a review of the results reported in these papers may be of some value for elucidation of the question raised above.

In the literature available to me, in papers published within the last 15 years, I have found more or less detailed information about 659 patients with this lesion. The following authors are included in this summation of results: *Kappis* (20) (22 cases); *Frising* (15) (26 cases); *Key* (21) (23 cases); *Wilson* (40) (7 cases); *Badgley* (2) (27 cases); *Willis* (39) (15 cases); *Field* (13) (3 cases); *Camitz* (7) (4 cases); *Jahss* (18) (3 cases); *Ferguson and Howorth* (12) (70 cases); *Waldenström* (36) (3 cases); *Friedrich* (14) (25 cases); *Nikolajsen* (30) (3 cases); *Kienbøck* (22) (8 cases); *Taylor* (35) (23 cases); *Capener* (8) (2 cases); *Wardle* (38) (3 cases); *Brailford* (4) (26 cases); *Jahss* (19) (3 cases); *Ellis* (11) (7 cases); *Waldenström* (37) (5 cases); *McAusland* (1) (43 cases); *Brogden* (5) (57 cases); *Scott* (32) (38 cases); *Pomeranz and Sloane* (31) (101 cases); *Sutro* (34) (2 cases); *Kleinberg and Buchmann* (23) (5 cases); *Milch* (28) (4 cases).

Among these 659 patients, the sex is given for 423. 270 men and 153 women. Even though no information is given about the sex of 236 patients (or a little over one third of the total number) it seems reasonable to reckon that *men are attacked by this disease twice as often as are women.* In 250 cases prior to 1926 Key found the ratio of sex distribution to be 4:1.

Localization of the lesion: In 64 of the 659 patients (nearly 10 %) the lesion was bilateral. In the rest, with a unilateral affection, distinction was made in 300 cases between right and left: Right hip involved in 122 patients, left hip in 178, or respectively 40 % and 60 %.

Therapeutic results: The late results are reported for 407 cases, a survey of which is given in Table 1. The table is arranged as follows: under each treatment the figures mean "hips", not patients, so that the same "hip" may be recorded under different

forms of treatment. Thus there are hips on which an attempt of manipulation treatment was made, before an operation was performed, and such cases are recorded under "poor" manipulation results and then classified among operative results. Likewise some hips were first treated with open reposition and later with arthroplasty.

From Table 1 it is seen that altogether 131 results (32 % of those recorded here) are reported as good; 110 (27 %) were fair; 96 (22 %) were poor; and 70 (19 %) were bad. All in all 207 hips were treated by manipulation, with the following results: 68 (33 %) good; 50 (24 %) fair; 53 (26 %) poor; and 36 (17 %) bad.

TABLE 1.

Late Results after Various Forms of Treatment, Collected from the Authors Cited Above.

	Total	Good	Fair	Poor	Bad
Untreated	14	1	6	7	
Treatment interrupted and insufficient	15		13		2
Rest in bed and physiotherapy	19	4	12	2	1
Supporting bandage	3	2	1		
Extension	10	4	6		
Extension + plaster	4	1	1	2	
Plaster bandage	19	10	3	6	
Impaction-fracture of the epiphysis (Jahss' method)	12	10	1	1	
Manipulation	207	68	50	53	36
Drilling	6	6			
Osteotomy of the neck	1				1
Wedge + peg	6	2	2	1	1
Realinement operation or operative correction	62	19	11	18	14 (1 died)
Arthroplasty	15		1	3	11
Sub- or transtrochanteric osteotomy	12	4	2	2	4 (1 died)
Palliative operation	2		1	1	
Total	407	131	110	96	70

Comments on these figures will be made after an account is given of our own material.

Author's Material.

The material here presented comes from *Dr. Bentzon's private clinic* (5 cases) and from the *Orthopædic Hospital, Aarhus* (O.H.A.) (19 cases). This makes altogether 24 patients, 18 men and 6 women. The lesion was unilateral in 20 patients (right hip in 10, left in 10), bilateral in 4.

A. Patients Treated by Manipulation.

In 13 patients the lesion was judged to be at a stage suitable for manipulation treatment. A survey of these patients is given in Table 2.

As shown in Table 2, this group comprises 8 men and 5 women; in all these cases the lesion was unilateral, 5 right, 8 left. The age of the patients at the onset of symptoms varied from 11 to 18 years; for most of them it was about 14. The duration of the symptoms varied between 2 and 12 months; thus this material includes no pronounced traumatic cases. A history of traumatic injury was found in 5 cases (Nos. 1, 3, 5, 8 and 9). In none of these the trauma was severe enough to give immediate symptoms or an acute aggravation of preexisting symptoms. Roentgenography showed pronounced displacement of the capital epiphysis in 7 cases, slight displacement in 6 cases.

In describing the anatomical relations here emphasis will be laid upon the displacement of the capital epiphysis—its downward and backward slipping in relation to the neck of the femur—instead of the academically more correct description: the upward and forward displacement of the neck in relation to the head. This way of description is chosen not merely for practical reasons alone. Even in fairly pronounced cases the position of the capital epiphysis is changed into some degree of flexion, inward rotation and abduction in relation to the anatomically normal position. This is evident from the X-ray pic-

TABL

Patients Treated wit

Patient No.	Record No.	Sex	Date of birth	Age at onset of symptoms (years)	Duration of symptoms prior to treatment (months)	History of trauma	Side involved	Endocrine disturbances	Other anomalies
1	QII 49	M.		11	5	+	R	+	
2	QII 60	F.		14	10		R		Adiposi
3	QII 61	F.	6/3 16	11	7	+	R		Adiposi
4	47/29	M.		14	2		L	+	
5	B. 214	M.	18/7 22	13	12	+	R	+	
6	B. 221	F.	26/2 22	14	2		L	+	Scolios
7	B. 772	M.	28/5 17	18	12		L	Infantilism	
8	B. 863	M.	22/10 21	15	2	+	L		
9	B. 1228	M.	20/7 22	14 3/4	6	+	L	+	
10	B. 1263	M.	24/1 22	14 1/2	6		L		
11	B. 2773	F.	4/2 23	14	3		L		
12	B. 3567	M.	12/12 23	13 3/4	6		R		
13	B. 4214	F.	20/3 23	14 1/2	6		L		

ture (see Fig. 1 b). Here the capital epiphysis appears lower; the lateral margin has become more medial in relation to the roof of the acetabulum, and the medial margin is more distal in the acetabulum than on the normal side (Fig. 1 a), when the roentgenogram is taken as usually in frontal view, *i.e.*, the patient recumbent on his back, with the legs parallel and the patellæ pointing straight forwards.

Constitutional anomalies in the form of slight endocrine disturbances tending to adiposogenital dystrophy were present in 5 patients (4 males and 1 female). One, a man, showed signs of infantilism. Case report as follows:

nipulation.

ree of pping	Roentgenological result				Functional result				Observation period (years)	Unsuitable for unqualified work	Remarks
Slight	Good	Improved	Unchanged	Worse	Good	Fair	Poor	Bad			
+				+				+	1	+	Transitory hæmaturia. Peroneal paresis. Reslipping. Calve-Perthes'dis. in L.hip.
	+				+				4		
+	+				+				7		
+		+				+			3		
				+				+	1 3/4	+	
+	+				+				1 1/2		
			+		+				1 1/2		
	+				+				1 1/2		
+		+			+				1 1/4		Fract. of femur
				+			+		1 1/4	+	
				+				+	1 1/4	+	
+			+		+				3/4		
			+			+			2/4		

Pt. No. 7.

Male, born 28/5—17. First examined in O.H.A. on 15/1—37, at the age of 19 years. 3 years before, admitted to the Aarhus County Hospital for various contusions (including contusion of the kidney); he stayed in the hospital 10 days. Otherwise past history of good health.

In the last year there has been a gradually increasing limp of the left leg. Tiredness of the leg after walking for some distance; now and then slight pain in the left hip. He held a job as farmhand till November 1936, when he quit working on account of increasing discomfort from the leg. Under hospital treatment for epiphysiolysis cap. fem. sin., from 16/11 to 21/12—36, with rest in bed, active and passive motions, and massage. As the condition got worse since his discharge from the hospital he was admitted to O.H.A. 3 weeks later.

Physical exam.: Habitus infantile; voice high-pitched. Genital small; pubic hair poorly developed.

Left leg slightly outwards rotated and abducted.

Mobility: Flexion 60°; extension 15°; abduction 20°; adduction 20°; outward rotation 55° (only 40° on the right side); inward rotation 0°. (Every gradation here means the extent of the movement from the anatomical normal position.)

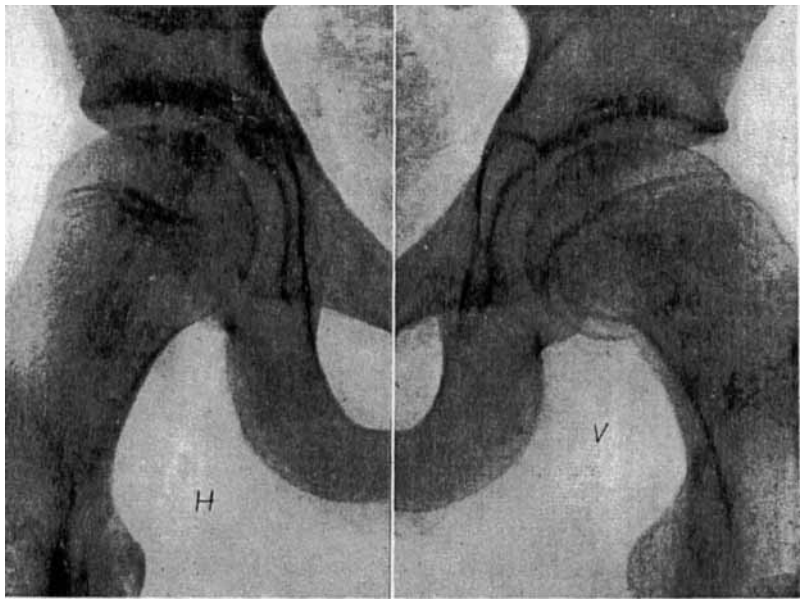


Fig. 1.
Case 7. a. Right hip. b. Left hip. 12/1—37.

Roentgenography (Fig. 1): Separation of the capital epiphysis of the left femur; no arthrosis (cf. description above).

19/1—37: Manipulation under ether anæsthesia, with considerable force. One has the impression that the attempt at reposition is not successful. Hip plaster cast.

16/3—37: Plaster cast removed.

Roentgenography: Position perhaps a little better. Massage and exercise prescribed.

18/4—37: Discharged from the hospital.

25/5—38: Lately he has been able to do some lighter work in a mill; no discomfort.

Mobility in the left hip practically free, excepting that the inward rotation is limited to 20° (right 45°).

Roentgenography (Fig. 2): Epiphyseal line closed. Capital epiphysis healed in unchanged displacement (rather slight improvement as compared to Fig. 1 b).

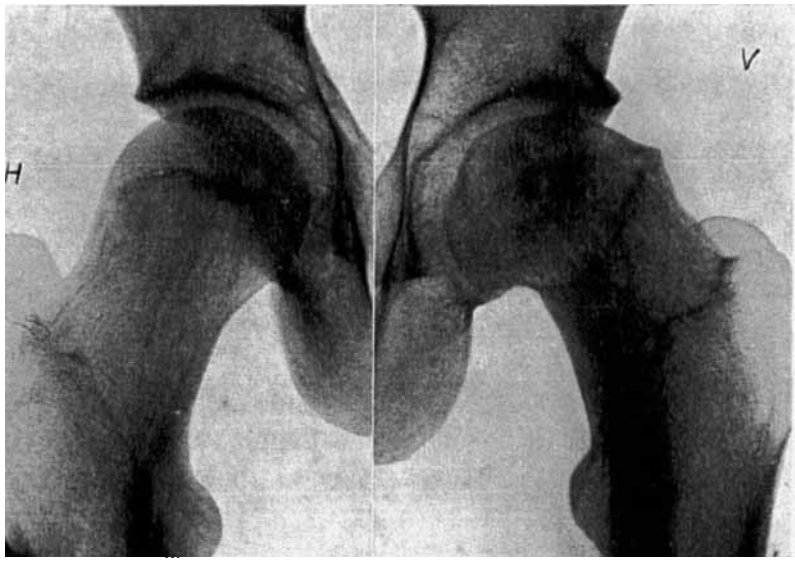


Fig. 2.
Case 7. a. Right hip. b. Left hip. 28/9—38.

28/9—38: Feeling well. Mobility as on 25/5—38. Roentgenogram unchanged. No arthrosis. (Arthrosis = arthritis deformans.)

His present condition was classified as roentgenographically unchanged, functionally good; it seemed safe to let him continue with light farm-work.

2 patients were overweighty for their age; 1 presented a marked scoliosis.

Treatment. Mention has been made already of the treatment as far as the manipulations for reposition are concerned. After this manoeuvre a plaster cast is applied to the hips with the legs in inward rotation, abduction and slight flexion. This ban-

dage is left on for 6—8 weeks, in the later cases somewhat shorter time, especially if the manipulation has not been successful. After-treatment: Massage, heat, active and passive motions and avoidance of all heavy work for a considerable length of time.

In estimating the therapeutic results, distinction is made between the roentgenographic result and the functional.

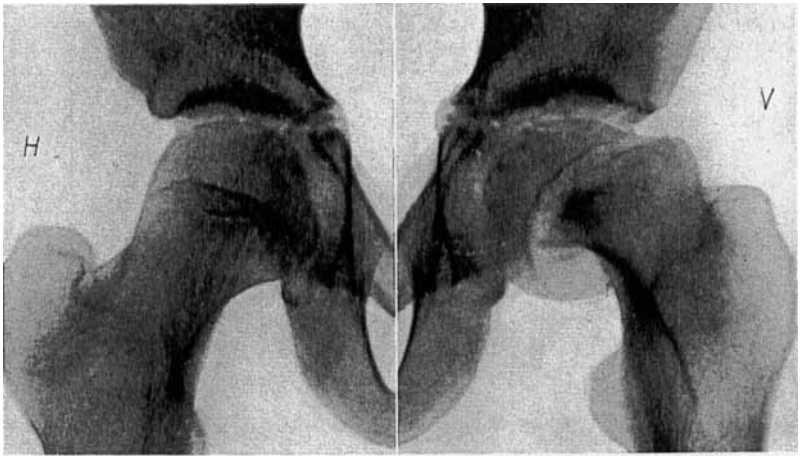


Fig. 3.
Case 8. a. Right hip. b. Left hip. 1/2—37.

Roentgenographic Results. In 4 cases (Nos. 2, 3, 6 and 8) the result has been roentgenographically good; in 2 cases (Nos. 4 and 9) the condition was improved; in 3 cases (Nos. 7, 12 and 13) it remained unchanged; and in 4 cases (Nos. 1, 5, 10 and 11) the condition was aggravated, in the sense of an arthrosis (arthritis deformans).

In order to illustrate the good results from manipulation treatment it will be appropriate here to cite one of the case reports.

Pt. No. 8.

Male, born 22/10—21. First examined in O.H.A. on 5/2—37.

Past history of good health. About 7 weeks ago, beginning complaints of pain in the left knee. Roentgenograms were made of the knees, but they showed no abnormality. In the last month the condition has been getting worse, and X-ray examination on 1/2—37 showed separation of the capital epiphysis in the left hip, with typical and rather considerable slipping of the cap. The patient had a fall in the X-ray room; otherwise no traumatic injury.

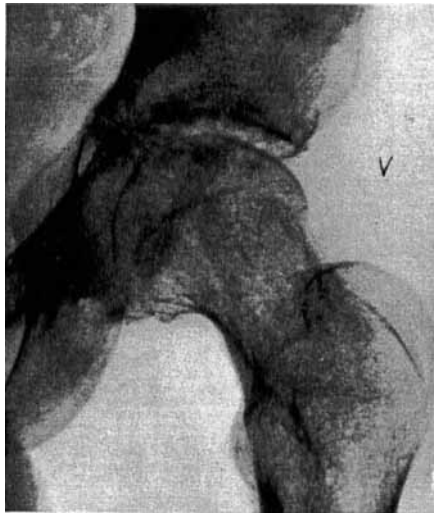


Fig. 4.
Case 8. Left hip. 24/5—37.

Physical exam.: Habitus normal. Walking very troublesome. When lying on his back he is unable to elevate the *left leg*. The left trochanter is displaced upwards, a little over 1 cm. The leg is outward rotated, extended and practically fixed in this position.

Roentgenography (see Fig. 3) shows considerable slipping of the capital epiphysis. The joint-space appears normal.

9/2—37: Manipulation under ether anæsthesia, under rather forcible manipulation. Then hip plaster.

6/4: Plaster removed.

24/5—37: Roentgenography (cf. Fig. 4) shows good reposition; only a moderate slipping revealed in side view; joint-space normal.

25/5—38: Patient feeling well. No limping. No muscular atrophy. Mobility in the two hips:

	Flexion	Extension	Abduction	Adduction	Inw. rot.	Outw. rot.
Right:	130°	20°	35°	30°	70°	45°
Left:	110°	20°	35°	30°	45°	70°

No indication is found for social care or disablement benefit. The patient wants to be a cabinetmaker.

28/9—38: Feeling perfectly well; never any pain. He is able to walk a long distance without any limping or discomfort.

Physical exam.: No difference from the findings on 25/5—38.

Roentgenography (Fig. 5): Healing of epiphyseal separation, leaving a slight degree of coxa vara epiphysarea, largely due to a bending of the juxta-epiphyseal part of the neck of the femur.

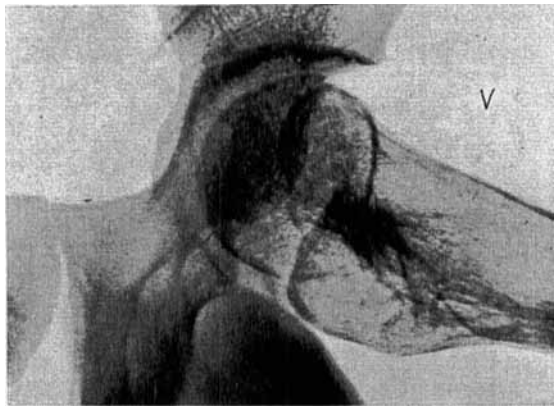


Fig. 5.
Case 8. Left hip. 28/9—38.

On account of an inconvenient complication the following case report is cited:

Pt. No. 9.

Male, born 20/7—22. First examined in O.H.A. on 30/3—37.

Past history of good health. About 1½ years ago he was kicked in the left buttock, but it gave him no discomfort afterwards. In August 1936, while playing, his left leg was pulled very strongly—but without any immediate consequences. In September 1936 he began to complain of pain in the left leg, especially over the knee. Roentgenography in the beginning of October 1936 is said not to have revealed any abnormality. Since there have been periodical attacks of pain and limping of the left leg. Roentgenography one week before examination revealed epiphysiolysis cap.fem.sin.

Physical exam.: Habitus reminding of adiposogenital dystrophy.

The left hip showed moderate upward displacement of the trochanter. The hip is rotated outwards, about 15°, otherwise in normal position.

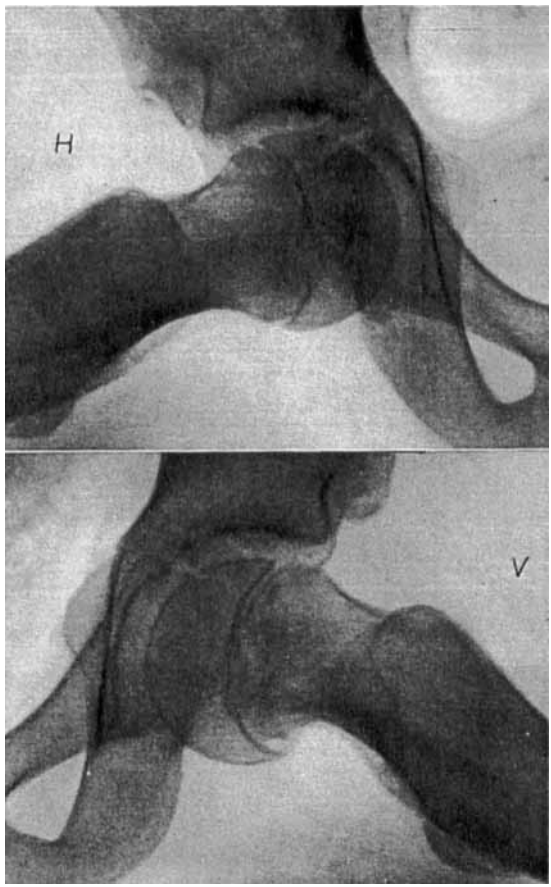


Fig. 6.
Case 9. a. Right hip. b. Left hip. 24/3—37.

Flexion 120°; abduction 10°; adduction 30°; inward rotation 0° (lacking 15° in reaching normal position); outward rotation 15—60°.

Roentgenography, on 24/3—37: In Lauenstein's projection there is seen a distinct posterior slipping of the left capital epiphysis (Fig. 6).

1/4: Manipulation performed under ether anæsthesia.

During the first attempt a slight cracking in the hip is noticed. As the inward rotation appears not yet to have become sufficiently free, a new attempt is made, and now a loud crack is heard, plainly from a fracture of the femur. Roentgenography shows a spiroid fracture of the body of the femur, a little over the middle. The fracture is displaced but moderately, corresponding to a slight inward rotation of the distal fragment.

24/4: Hip plaster cast applied. Thyroid therapy prescribed.

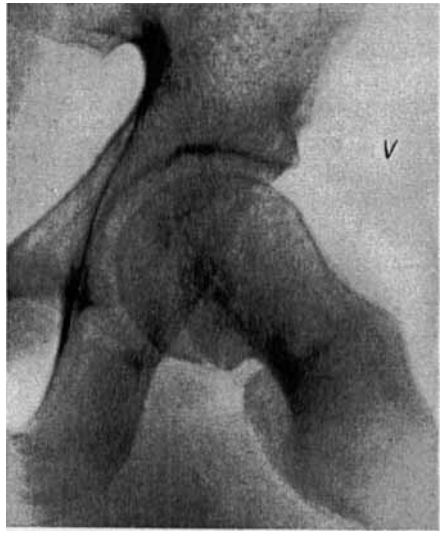


Fig. 7.
Case 9. Left hip. 28/2—38.

5/6: Plaster removed.

21/6: Capable of active lifting of the left leg. Up.

2/7: Lower extremities of the same length. The patient walks very well with the support of a cane. Fracture perfectly firm. Good mobility in the hip. Discharged.

28/2—38: Has been feeling well; thyroid is prescribed periodically. Mobility of the two hips:

	Flexion	Extension	Abduction	Adduction	Inw. rot.	Outw. rot.
Right:	120°	20°	50°	30°	30°	50°
Left:	120°	20°	45°	30°	55°	25°

24/1—39: Feeling perfectly well. (Habitus now normal.) Left leg shortened 2 cm. Free mobility of the hip.

This case illustrates that the attempts at reposition have to be carried out with some caution; still, one is inclined to think that the bones of this patient on the whole have been more friable than normally, for it does not seem very likely that one should be able to fracture a normal femur by mere strength of hand—let alone a torsion fracture. But the case is not unique in the literature. *Drehmann* (10) has advised against this complication, unfortunately without giving any casuistics, and I have not been able anywhere to find any report of similar cases. Furthermore, it is interesting to point out that the fracture did not involve the neck of the femur even though the effective force here must have been far greater. The epiphyseal slipping was diminished (see Fig. 7). The functional result was excellent, but with a little overcorrection for inward rotation, owing to the fact that the fracture healed with a little inward-rotational displacement of the distal fragment.

The most dreaded complication in the course of the disease is a more or less pronounced secondary deforming of the capital epiphysis and narrowing of the joint-space, resulting in more or less complete ankylosis. We have seen this outcome in 3 cases. The question whether this arthrosis is a complication of the disease or a complication of the treatment is of importance in estimating the prognosis and in judging of the therapy employed. In order to throw some light on this problem the next two case records are cited.

Pt. No. 5.

Male, born 18/7—22. First examined in O.H.A. on 19/10—36.

Past history of good health. In the last year the boy has had a limp in his right leg, beginning after an injury he suffered while playing football. The injury was caused as follows: he missed the ball when kicking at it, and hit the ground instead. He at once felt a pain in his right hip, so that he had to quit the game. He kept quiet the rest of that day, but next day he again turned up at school. Later he entered the hospital where he stayed from 28/9 to 29/11—35 under the diagnosis: Epiphysiolysis cap.fem.dext. Roentgenography showed that the capital epiphysis had slipped a little downwards and backwards. The epiphyseal line was more open than on the left side. The patient was treated with plaster bandage (without any attempt at reposition) till 15/11. On discharge, 2 weeks

later, he walked rather well. After discharge, he kept on having a limp. About 3 months ago, in June 1936, roentgenography (Fig. 8) showed slipping of the epiphysis on the right side downwards and backwards, slight narrowing of the joint-space, but no true structural changes. On account of a practical shortening of the right leg the heel of his right boot was heightened 3 cm.

Since then, the hip symptoms have been getting worse; in particular, lately there have been attacks of pain radiating down in the knee almost preventing him from walking.

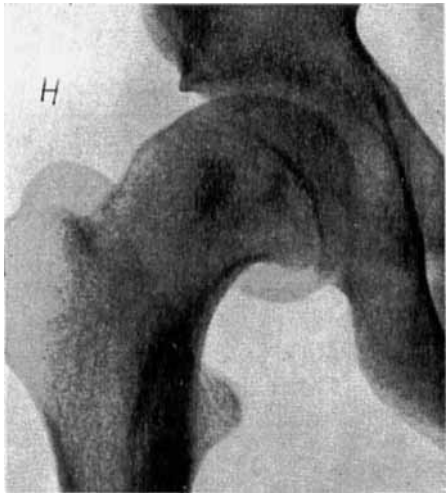


Fig. 8.
Case 5. Right hip. June 1936.

Physical exam.: Habitus as in adiposogenital dystrophy.

Right hip is kept outward-rotated, otherwise normal position. On attempt at movements of the leg the pelvis moves too. The trochanter is displaced upwards. Free mobility in the left hip.

Roentgenography (Fig. 9): Rather considerable slipping of the capital epiphysis on the right side. *The dislocation is more marked than on the roentgenogram from June 1936.* The joint-space is still somewhat narrow.

30/10—36: Admitted to O.H.A.

2/11: Zinc glue extension, with traction of 7 kg.

14/11: As traction has not brought any change in the position, a manipulation under ether anæsthesia is attempted. There is considerable stiffness of the joint even under anæsthesia, so that the manoeuvre approaches "brisement", whereafter the inward rotation and abduction are released noticeably. Plaster bandage in abduction + inward rotation.

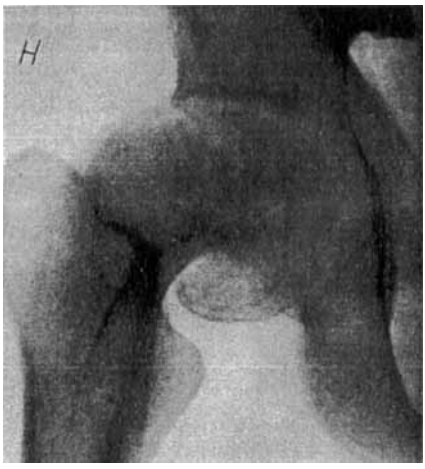


Fig. 9.
Case 5. Right hip. 19/10—36.

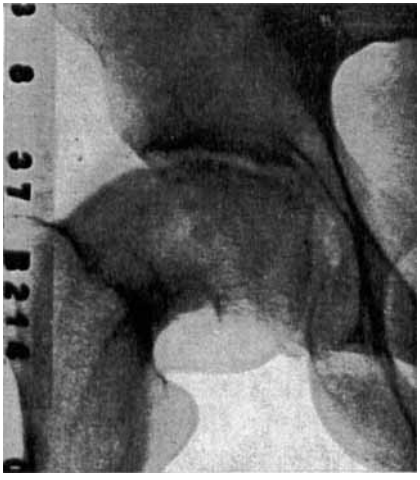


Fig. 10.
Case 5. Right hip. 23/8—37.

9/1—37: Plaster removed.

11/1: Roentgenography shows flattening of the head, slipping downwards and medially. Joint-space narrowed. Contours of the lateral part of the head and acetabulum irregular Physiotherapeutic measures prescribed.

17/2: The hip keeps very stiff. Discharged.

23/8—37: No pain. Walking indoors without cane.

Physical exam.: Right hip shows ankylosis in light adduction and light flexion.

Roentgenography (Fig. 10): Deformation of the head unchanged, epiphyseal line closed; joint-space greatly narrowed.

15/6—38: For the sake of the patient's educational training, the correction of the adduction contracture of the hip is postponed, this deformity

a. b.

Fig. 11.
Case 10. a. Right hip. b. Left hip. 16/3—37.

is unchanged). Practical shortening, 4 cm. The leg tires quickly, but there is no pain. The Invalidity Insurance Council provides for educational training of the patient in the "Society and Home for Crippled".

Pt. No. 10.

Male, born 24/1—22. First examined in O.H.A. on 5/4—37.

Past history of good health. About 1½ years ago the patient had a fall with his bicycle, hitting the left side, especially the knee, against the ground; this was not followed immediately by any particular discomfort. About half a year ago, without any new traumatic injury, he began to have a limp in his left leg. One month ago he had pain in his left knee. Since November 1936 he has been working as a farmhand, able to do his work well; but when the limping increased he sought medical advice.

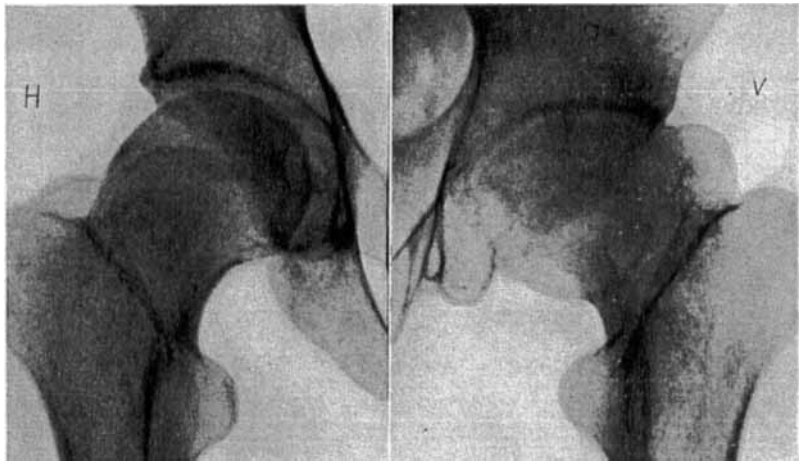
Roentgenography, 16/3—37, showed epiphysiolysis cap. fem. sin., with slight narrowing of the joint-slit (see Fig. 11).

Physical exam.: Habitus normal.

Left leg outward-rotated 20°, otherwise normal position. Atrophy of the left thigh, 4 cm.; of the left calf, 1 cm. Distinct gluteal atrophy.

Mobility: Flexion 90°; abduction 10°; inward rotation 0°; other movements almost free.

Repeated roentgenography: Anteversion of the neck of the femur;



a. b.

Fig. 12.
Case 10. a. Right hip. b. Left hip. 26/10—36.

slipping of the head, downwards and backwards. Considerable narrowing of the joint-slit. Epiphyseal line distinctly visible; so the process has not healed completely.

20/4—37. Admitted to O.H.A.

24/4—37: Manipulation under ether anæsthesia, with rather considerable force; but the position was not improved. Hip plaster cast applied, in strongest possible inward rotation + abduction.

5/6: Plaster removed.

Roentgenography: Position of the head unchanged; joint-space more narrowed; some halisteresis. Physiotherapy prescribed.

20/6—37. Walking about with support of 1 cane. Discharged.

3/4—38. No pain. Flexion 60°. Difficulty in sitting on a chair.

Roentgenography (Fig. 12): Epiphyseal line closed, Capital epiphysis in unchanged position. Joint-space greatly narrowed.

6/4—38. Some improvement. He is able to ride bicycle without difficulty.

Physical exam.: No measurable shortening. Leg kept somewhat outward-rotated. Mobility of left hip: Flexion 60°; extension 10°; abduction 10°; adduction 15°; outward rotation 10°—30°; inward rotation 0° (unable to reach to normal position). Marked crepitation in the joint.

26/10—38: Left hip now almost ankylotic in 25° flexion, 5° adduction and 20° outward rotation. Practical shortening, 3 cm. Atrophy of the thigh, 4 cm. Walking about with 1 cane. No pain.

He is judged to be unfit for unqualified work.

The first of these two cases (No. 5) presents the particular feature, that a secondary slipping of the epiphysis takes place without traumatic injury (cf. Figs. 8 and 9).

Friedrich states that he has never seen different stages of slipping; and he adds that though a few authors assert to have observed such a phenomenon, no case is "durch wirklich beweiskräftige Röntgenbildern belegt".

In both of these cases there was some narrowing of the joint-space before the manipulation treatment was attempted, and this has been a sign of the beginning arthrosis. The attempt at reposition was made in keeping with the view, that if the capital epiphysis were loose, it would presumably obtain better conditions for nutrition in correct position than in slip-position. But this attempt proved unsuccessful. One can not exclude the possibility that the treatment may have aggravated the development of arthrosis, but this admission is not quite the same as blaming the manipulation treatment for the bad result. Anyhow, cases treated with manipulation are hardly suitable for establishing whether the arthrosis is a complication of the disease as such. To prove this it requires that instances of arthrosis of similar malignant character are encountered also among cases under absolutely conservative treatment.

The functional result is considerably better than the roentgenological. Seen from this point of view there are 7 good hips, 2 fair, 1 poor, and 3 bad. In this connection, the term "fair" implies a mobility of at least 90° flexion and at least 20° abduction. "Poor" means all cases with less than 90° flexion and with fixed outward rotation. Under the heading "bad" are enter-

ed stiff, or nearly stiff, hips, even if they are in a "good" ankylosis position. The observation period has been over 1 year in all these cases except the last two, in which it has been 9 months.

In Denmark, through the Invalidity Insurance Council, it is possible for insured adults, children under 15 years, and adults between 15 and 18 years who do not fulfil the requirements for being insured, to be helped to protective measures, including educational training in a suitable trade, if they are suffering from some lesion or deformity that implies a risk of essential, not transitory, impairment of their earning capacity. Therefore, before a patient is left out of control, it has to be decided whether in his case there be medical indications for social care. The so-called "unqualified" work makes the greatest demands on physical ability in general. If a patient is judged to be unfit for unqualified work, his case is reported to the Invalidity Insurance Council, which then decides on the steps to be taken in his particular case.

Four of the patients (Nos. 1, 5, 10 and 11) belong to this category. No. 6 really belongs to the same category though not on account of her hip lesion but because of severe scoliosis. The other cases were not found to call for the application of social measures.

B. Patients with Sequelæ after Epiphysiolysis cap. fem.

The following 11 patients, who were not examined in our hospital before the original slipping of the capital epiphysis had healed, may naturally be taken as a group by themselves. They represent the more unfortunate cases, and hence one has to be rather cautious in dealing with them statistically. Usually we do not see the good results from other hospitals—or only through systematic investigation of such materials.

Table 3 gives a survey of main features in their case histories. There are 10 men and 1 woman. In 4 patients both hips were affected; in 5 the lesion involved the right hip, in 2 the left. Information of traumative injury was given in 5 cases. This examination was performed from 1 to 15 years after the onset of symptoms.

TABLE

Patients with Sequelæ after

Patient No.	Record No.	Sex	Date of birth	Age at onset of symptoms (years)	Duration of symptoms prior to treatment (years)	History of trauma	Side involved	Previous treatment	Constitutional anomalies
14	QII 47	M.		14	1 1/2	+	R.	Rest in bed. Massage	0
15	B. 392	M.	9/10-17	16 8/4	2 1/4	+	Both	Rest in bed. Massage	0
16	B. 794	M.	24/4-18	16	3		R.	Rest in bed.	0
17	B. 1020	F.	22/9-12	10	15	+	L.	Extension. Rest in bed. Massage	0
18	B. 1552	M.	3/2-20	16	1		L.	Extension, 14 days. Rest in bed, 12 wks.	0
19	B. 3000	M.	30/3-09	16	R. 12 L. 11		Both	Reposition, right. Extension. left	0
20	B. 714	M.	1/4-14	14	9		R.	Untreated	0
21	B. 1065	M.	5/4-07	15	15	+	R.	Untreated	0
22	B. 3196	M.	31/8-12	22	3	+	Both	Untreated	0
23	B. 3841	M.	31/5-18	15	3		R,	Untreated	0
24	B. 4067	M.	24/12-21	14	1 1/2		Both	Untreated	0

The previous treatment had been rest in bed and physiotherapy in the cases of 3 patients (4 hips). 2 patients (2 hips) had been treated with extension and subsequent rest in bed and physiotherapy. I patient (2 hips) had been treated by manipulation and plaster cast for the right hip, and extension for the left hip. 5 patients had received no treatment.

Roentgenography showed a considerable degree of coxa vara epiphysarea in 3 hips, a pronounced degree of this lesion in 9 hips, and moderate in 3. Arthrosis was demonstrated in 5 patients (6 hips) ; 3 showed fixed faulty positions (flexion-adduction contracture in 2, abduction contracture in 1).

On ordinary clinical examination, none of the patients in this group showed any sign whatever of endocrine disturbances.

3.
Epiphysiolysis cap.fem.

Other anomalies	Fixed faulty position	Roentgenological findings		Treatmcnt	Functional condition				Unsuitable for unqualified work
		Coxa vara epiphysarea	Arthrosis		Good	Fair	Poor	Bad	
	+	Marked		Subtrochanteric osteotomy		+			
		Marked, bilat.		None		R.	L.		+
	+	Marked	Ankylosis	Subtrochanteric osteotomy				+	+
Adiposis		Marked	Marked	Resect. n. obturat. Mytom m. peetin. sin.		+			+
	+	Marked	Marked	Repair of abduction contrakture			+		+
		Marked, bilat.	Marked, bilat.	Orthopædic footwear		L.	R.		+
		Moderate		None	+				+
Spastic hemiparesis r		Marked	Marked	Orthopædic footwear				+	+
Kyphosis dorsalis		Marked,		Extension, rest in bed.	L.	R.			
		Marked bilat.		None		+			+
		Moderate, bilat.		None		Both hips			+

One patient (No. 17), the only woman in the group, was overweighty; another (No. 21) suffered from spastic hemiparesis on the right side. One (No. 22) had kyphosis (healed kyphosis Scheurmann).

Treatment. In two cases, Nos. 14 and 16, with flexion-adduction contractures the treatment consisted in subtrochanteric osteotomy, resulting in complete correction of the faulty position; in one the function of the hip-joint became satisfactory, in the other the ankylosis persisted. In one patient, No. 17, suffering from arthrosis with tendency to adduction, the treatment consisted in resection of the obturator nerve and myotomy of the pectineus; this gave improvement not only of the faulty position but also of the function of the hip-joint.

In 2 cases (Nos. 18 and 22) the treatment consisted in rest in bed and extension. 2 patients (Nos. 19 and 21) were given orthopædic footgear, on account of shortening of the leg. In 4 cases (Nos. 15, 20, 23 and 24) no indication was found for medical treatment, but for social measures. The functional condition of the hips is recorded here after the same principles as for Group I, giving 2 good hips, 8 fair, 3 poor, and 2 bad.

In 2 cases (Nos. 14 and 22) the condition was judged not to require social measures. All the other patients were considered unfit for unqualified work.

Because of the late appearance of the symptoms the following case report is quoted:

Pt. No. 22.

Male, born 31/8—12. First examined in O.H.A. on 28/12—37.

Rickets and scrophulosis in early childhood; diphtheria at the age of 8 years. The patient states he was well since; he was rejected for military service, presumably on account of kyphosis. 3 years ago he had a fall with his bicycle, hurting his right knee. Since then he has been troubled with increasing pain in both hips. Still, he was able to tend to his work as a farmhand till shortly before the present examination.

Physical exam.: Appearance normal; mentally, somewhat dull. Height, 177 cm. Weight, 67 kg. Rather pronounced arcuate kyphosis, completely fixed. No scoliosis. (Healed juvenile kyphosis Scheurmann).

Lower extremities: Equal length. Right hip slightly adducted and outward rotated, but it can be corrected passively to normal position. Abduction reduced on both sides. Inward rotation totally restricted.

Roentgenography. 3/1—38 (see Fig. 13): Bilateral deformity of the head of the femur as in healed separation of the capital epiphysis with displacement downwards and backwards. Joint-space not narrowed.

Treatment: Rest in bed, and extension applied to the right leg, for 4 weeks. Discharged on 26/1—30.

Reexamination, 27/4—38: Feeling well. Able to do all his work. No pain in hip since he left the hospital.

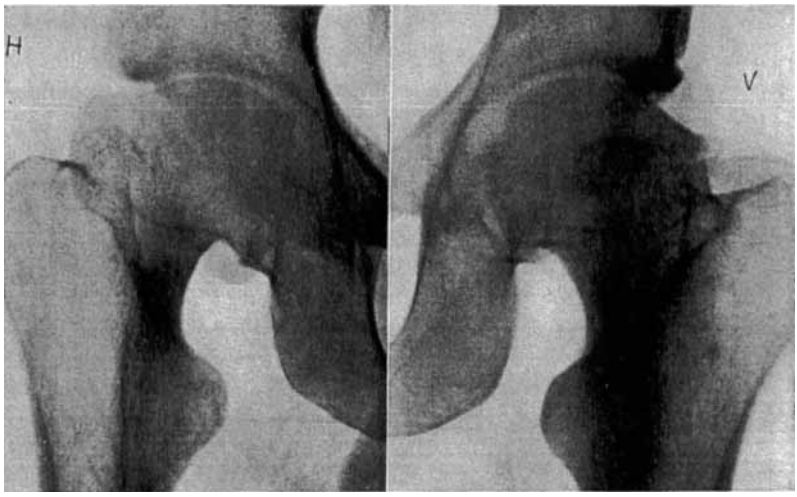
Physical exam.: Mobility in the hips:

	Flexion	Extension	Abduction	Adduction	Inw. rot.	Out. rot.
Right:	90°	20°	30°	30°	0°	45°
Left:	135°	20°	30°	30°	0°	30°

He is judged to be fit for farm work.

16/11—38: Getting along well in a job of ordinary farmhand. Physical exam. shows no changes. Roentgenography: No changes. No arthrosis.

In this case no information is given about hip symptoms in adolescence, and yet the heads of both femurs are deformed as after slipped epiphysis, and there is a characteristic reduction of the mobility. The fact that his kyphosis has given no discomfort does not detract from the probability of a symptom-free course of the hip lesion. On the other hand, absence of symptoms



a. b.

Fig. 13.
Case 22. a. Right hip. b. Left hip. 3/1—38.

in the past cannot be established with absolute certainty, as the patient is somewhat dull and may have forgotten a discomfort that ceased long ago.

It seems unquestionable that epiphysiolysis in several cases takes a benign course, healing after some length of time of moderate inconvenience, without giving occasion for treatment. The 5 untreated patients (7 hips), Nos. 20—24, illustrate this point. No. 21 has a severe degree of arthrosis, however, but his case is complicated by spastic hemiparesis on the right side and mental debility, and this may have been one reason why no medical advice was sought, and why arthrosis developed subse-

quently. This case is therefore left out of consideration in judging of the occurrence of arthrosis under conservative treatment.

The other 6 patients (8 hips), Nos. 14—19, were given conservative treatment as said above—except in the case of No. 19, in whom reposition of the right hip had been attempted, with poor result (marked arthrosis). The reexamination demonstrated total ankylosis in 1 patient and pronounced arthrosis in 2 patients, respectively 3, 15 and 1 years after the onset of symptoms (Nos. 16, 17 and 18). No. 19 presented a slight arthrosis of the extension-treated left hip 11 years after the treatment.

Pt. No. 16.

Male, born 24/4—18. First examined in O.H.A. on 15/3—37.

Past history of good health. Onset of present illness in May 1934 with pain in the right hip and limping; no history of traumatic injury. Not until 1½ years later, in October 1935, his condition was so bad that he entered a hospital where he stayed from 28/10—35 to 30/4—36 (6 months).

Roentgenography, 28/10—35: The right hip shows a slight widening of the joint-space. The articular surface of the acetabulum is slightly irregular, with a mixture of densities and clearings in a semilunar area corresponding to the point where the greatest weight is presumed to be supported. The head of the femur is sickle-shaped and rotated, so that its margin is near the lesser trochanter; the neck is shortened, or strongly bent, the upper outline of the neck and the head forming a regular convex arch that articulates with the acetabulum. No doubt this is an instance of slipped epiphysis, but I am inclined to think that in the acetabulum we also find processes resembling Calvé-Perthes' disease (signed Rask-Nielsen).

Treatment: Rest in bed, with the leg placed between sandrolls, later on physiotherapy.

After his discharge from the hospital, the patient has not been able to work, and now he is referred by the Invalidity Insurance Council to our hospital for treatment.

Physical exam.: Habitus normal. Gait limping, with pronounced swinging of the body to the right.

Right hip fixed in about 35° adduction, 45° outward rotation and practically complete extension. There is ankylosis in this position. On account of the adduction there is a practical shortening of 9 cm. Knee and ankle normal. Muscular atrophy of the right thigh, 6 cm.; of the right calf, 2 cm.

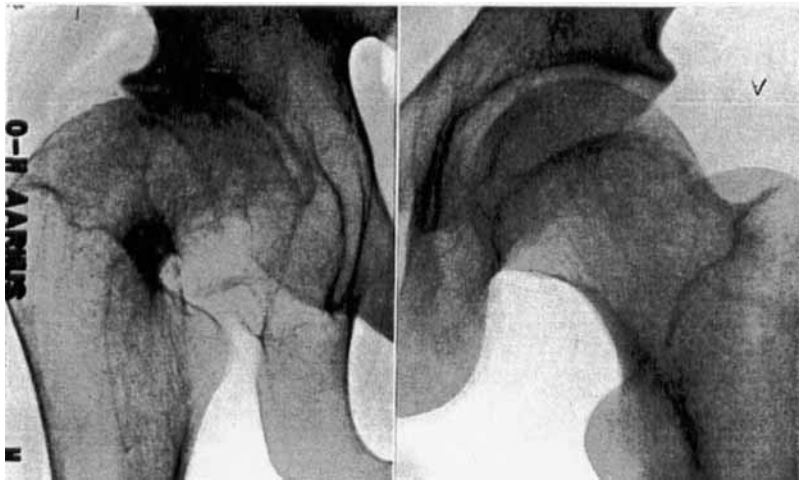
Roentgenography (Fig. 14): Marked shortening of the neck on account of outward rotation. Head deformed, mushroom-shaped. Joint-space great-

ly narrowed, in some parts indistinguishable. Osteophyte-formation at the upper margin of the acetabulum. Marked adduction position.

20/3: Subtrochanteric osteotomy.

Post-operative course uncomplicated. Patient discharged on 19/7—37 with ankylosis of the right hip in 20° abduction, 10° flexion and normal rotation position. Real shortening of 4 cm.

Half a year later he had a fall with his bicycle and suffered an infraction at the site of the osteotomy.



a. b.

Fig. 14.
Case 16. a. Right hip. b. Left hip. 18/3—38.

Reexamination on 9/5—38 shows unchanged features, except that the abduction amounts only to a few degrees.

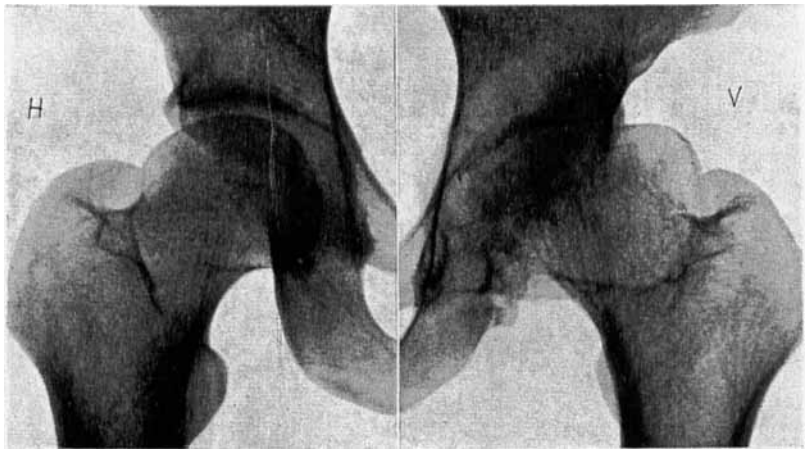
21/11—38. The patient feels much stronger now than before, but he is somewhat inconvenienced by the shortening. Examination shows no change in the position of the leg. Shortening 4 cm. Orthopædic footwear prescribed.

Pt. No. 17.

Female, born 22/9—12. First examined in O.H.A. on 24/2—37.

Good health in childhood. At the age of 10 years the patient fell and hurt her left hip. After this, she began to limp and have pain in the hip. She was hospitalized from 9/2—23/5—23, and treated with traction for 7 weeks (case report and roentgenogram not obtainable). Treated in another hospital from 21/8—23 to 22/2—24, where roentgenography is stated

to have shown compression of the left capital epiphysis of the femur, and the lesion was taken to be Calve-Perthes' disease (roentgenograms not obtainable). She has had a limp since then, and often pain in her left hip. Hospitalized again from 15/8 to 30/10—34 under the diagnosis: Osteoarthritis coxæ deformans. Roentgenography: Marked narrowing of the joint-space; head of the femur markedly deformed, subluxated upwards (roentgenograms lost). (These data have been obtained through correspondance with the respective hospitals.)



a. b.

Fig. 15.
Case 17. a. Right hip. b. Left hip. 24/2—37.

Since her last hospitalization, she has learnt sewing, through arrangement made by the Invalidity Insurance Council. Now she applies for additional treatment, as she walks poorly.

Physical exam.: Somewhat obese, but otherwise of normal appearance.

Left lower extremity slightly adducted, with a practical shortening of 4 cm. Muscular atrophy of the left thigh, 4 cm.; of the left calf, 2 cm.

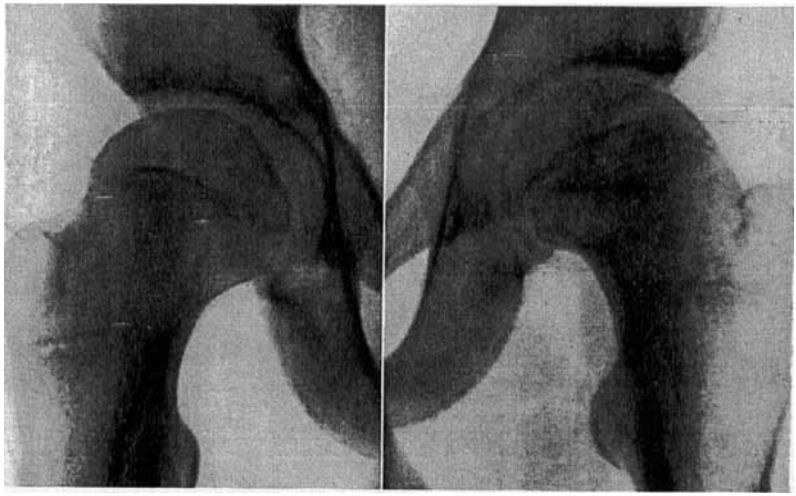
Mobility of the left hip very slight, except flexion.

Roentgenography (Fig. 15): Left hip-joint considerably deformed. Capital epiphysis slipped downwards and backwards, apparently flattened, with numerous pea-sized subchondral clearings. Marked narrowing of the joint-space, especially laterally. Slight subluxation upwards and outwards.

The treatment has been mentioned above.

The lesion is taken to be epiphysiolysis, but it may be the result of Calvé-Perthes' disease. Sometimes the final stages of

these conditions are difficult to differentiate. Hence the original roentgenograms would have been the more interesting, but, as mentioned, it has not been possible to obtain them. Owing to this want of absolute certainty about the accuracy of the diagnosis, this case has been left out of consideration in estimating the occurrence of arthrosis in epiphysiolysis cap. fem.



a. b.

Fig. 16.
Case 18. a. Right hip. b. Left hip. 31/8—36.

Pt. No. 18.

Male, born 3/2—20. First examined in O.H.A. on 10/5—37.

About 1 year ago he began to have a limp in his left leg. On 31/8—36, about 3 months after onset of the symptoms, he was roentgenographed. Fig. 16. a. b. This examination showed separation of the capital epiphysis of the left femur. In Lauenstein's posture (Fig. 16 c) the slipping was seen to be about 1 cm. *The capital epiphysis itself was perfectly smooth, with normal structures. Joint-space normal. Acetabulum also normal.* He was hospitalized; treated with extension for 14 days, then rest in bed for 12 weeks.

Roentgenography, 16/12—36 (Fig. 17), showed in left hip *narrowing of the joint-space; no change in the position of capital epiphysis, but faint development of callus between the epiphysis and the neck of the femur, inferiorly.* After this, physiotherapy. Discharged 23/2—27.

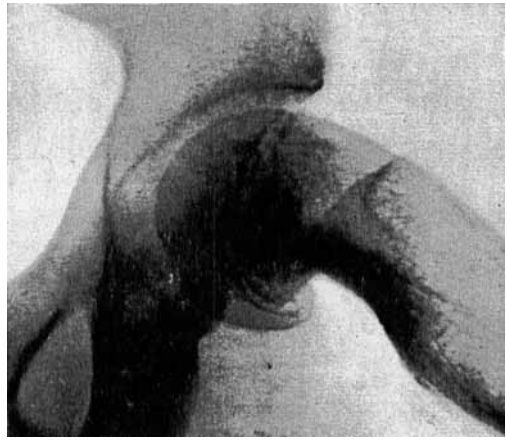


Fig. 16 c.
Case 18. Left hip. 31/8—36.

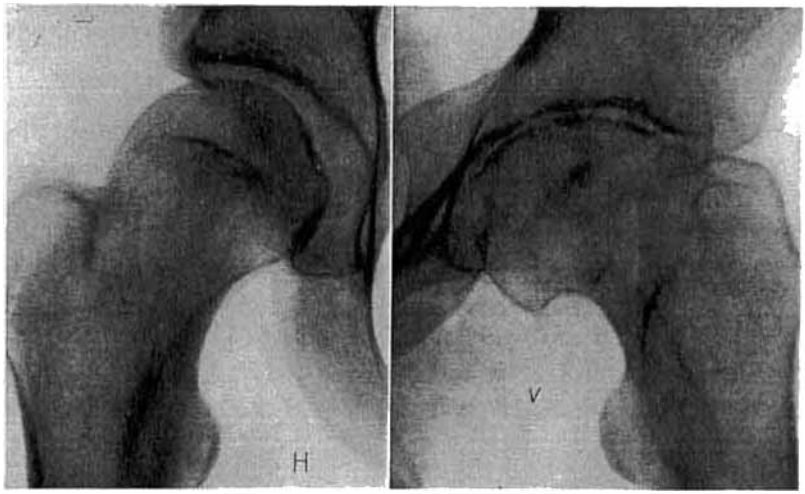
Fig. 17.
Case 18. Left hip. 16/12—36.

On control examination, in the same hospital, *6/4—37, roentgenography of the left hip showed irregular narrowing of the joint-space; outlines of the acetabulum and the head irregular; some halisteresis.*

As the hip kept getting more and more stiff, he was referred to O.H.A.

Physical exam.: Appearance normal.

Left hip in slight flexion contracture, somewhat outward-rotated and *abducted.* Hip almost ankylotic in this position. Attempt at movement gives pain.



a. b.

Fig. 18.
Case 18. a. Right hip. b. Left hip. 10/5—37.

On account of the abduction, the left leg shows a *functional lengthening* of about 4 cm. Muscular atrophy of the left thigh, 3 cm.; of the calf, 1.5 cm.

Roentgenography, 10/5—37 (Fig. 18): Left femur outward-rotated, abducted; head deformed as in healed slipping of the epiphysis; joint-space narrowed.

As an abduction contracture is somewhat more difficult to treat than an adduction contracture, it will be appropriate to mention the treatment: Plaster cast on the *left* leg, from the upper part of the thigh to the ankle; zinc-glue extension bandage on the *right* leg, with traction of 4 kg. After 2 weeks the abduction contracture was cured.

Reexamination, 16/5—38: Feeling well. No pain. Walking better. Flexion in left hip 60° from the mean; other movements very small. Position good for a nearly fixed hip.

These case histories show that in the present group arthrosis has appeared in 2 cases, where this process may be said most probably to be a complication of disease, not a complication of treatment.

In the case of Pt. No. 16 the objection may be raised that the patient was not examined till 1½ years after onset of symptoms, and that the want of treatment has brought about the arthrosis. In the other case (No. 18) treatment was instituted relatively early; yet arthrosis developed, in spite of very gentle treatment, while the patient was still resting in bed. Of course, we must not overestimate the significance of these findings, because the development of arthrosis as a complication of disease does not exclude the possibility that arthrosis in other cases might result from the treatment. *On the other hand, in judging of the prognosis we have to keep in mind that the disease by itself may lead on to a poor functional result.* This point is emphasized because, as far as I have been able to find out, it is not mentioned in the literature.

Discussion of the Principles of Treatment.

In Table 1 a survey is given of the more important forms of treatment.

Distinction has to be made between methods aiming at correction of faulty position and methods aiming at avoiding an additional deformity. Speaking in favour of the active methods is the fact: that only through such methods it is possible to obtain anatomical and functional restitution *ad integrum*. Indeed this point has not been contested, but it has been asserted the more emphatically that the good results, which are indisputable, have been obtained at too high a cost—that the risk of a functionally bad result is too great.

The counter-argument set forth by the activists is: that a hip-joint in which a slipped epiphysis has healed in displaced position is a defective joint where the deformity will give rise

to secondary arthrosis—even though it may take decades before this process develops.

This point has been disputed by *Friedrich* (14), who says: "Übrigens ist auch eines der Hauptarguments, das für die unblutige oder auch blutige Reposition sprechen konnte, die Behauptung, dass jeder Fall von nicht entsprechend behandelter Coxa vara epiphysarea in sekundäre Arthritis ausgehen *muss* nicht richtig. Wir verfügen über 2 Beobachtungen, nach denen bei unbehandelter Coxa vara epiphysarea nach 30, ja sogar nach 50 Jahren *die sekundäre Arthritis ausgeblieben war,* und Schmerzfreiheit bestand (Abb. 13)". The legend of *Friedrich's* Fig. 13 is: "Alte Coxa vara von Typ I 50 Jahre nach Beginn. *Keine schwere Arthritis deformans.* Vollig schmerzfrei, aber starke Bewegungseinschränkung". The conclusion is contradicted by the premises.

Far more serious is the viewpoint which asserts that the active treatment is injurious. *Camitz* (7), for instance, is very clear in his stand on the question as far as the manipulation treatment is concerned: "Dagegen teile ich voll und ganz seine (*Mau*) Ansicht über die Schwierigkeiten der unblutigen Repositionsmethode, deren Unzweckmässigkeit und die grosse Gefahr, welcher der Pat. dabei ausgesetzt wird. Denn seit *Hofmeister* wissen wir, und auch *Haglund* hat ebenso wie jetzt *Mau* betont, dass die unbehandelten traumatischen Epiphysenablösungen in der Regel im Laufe der Jahre besser und besser funktionieren, trotzdem die Röntgenplatten eine unveränderte Verschiebung des Caput aufwiesen".

Before the condition "coxa vara" was recognized, as mentioned already in the introduction, these cases were diagnosed most often as coxitis. The reason why *Hofmeister* (16) in 1894 was able to gather 45 cases of coxa vara was that he reviewed the coxitis material from Brun's clinic and discovered that the lesion in several of the "good cases" was coxa vara. In a paper of 1898 *Hofmeister* (17) investigated the spontaneous course of "coxa vara statica". The ability to work could be estimated in 29 of 32 cases. Of these 29 patients 23 had resumed their previous occupation, 4 had turned to a lighter kind of work, and 2 to

sedentary work. There can be no doubt, however, that the term "coxa vara statica" does not quite cover what we call "coxa vara epiphysarea"—there are, for instance, some rachitic deformities in *Hofmeister*'s material. Nevertheless, *Hofmeister*'s studies are most interesting. He wishes to fight down the employment of resection and collum osteotomy, as these operations give bad results; he recommends rest in the acute phase of the disease and prolonged use of bandages. To *Hofmeister*, I think, "spontaneous course" of the disease means the course under and after conservative treatment. Besides he points out that, while the patient feels better, the reduction of mobility due to the deformity does not disappear.

Turning back to more modern results, we may again consider the figures recorded in Table 1. At a first glance one might perhaps be inclined to agree with *Pomeranz* and *Sloane* (31) when they conclude: "We can postulate categorically that the more radical the surgical procedure the worse the end-result". A more close study of the figures shows, however, that for the present, at any rate, this conclusion has to be designated as a postulate. A fairly large material is available only in the group treated with manipulation: 207 hips in which the results were good in 33 %, fair in 24 %, poor in 26 %, and functionally bad in 17 %. The second largest group consists of cases treated with operative reposition: 62 hips with results that differ but little from those in the preceding group. Numerically, then, the active methods predominate considerably. Some of the other methods are intended only for treatment early in the disease, when the slipping is only slight. This applies to the employment of impaction-fracture of the epiphysis (*Jahss* (19): "Cotton mallet impaction"); but in 1 of the 12 cases a slight slipping was changed into a total slipping by this treatment. Drilling is used only in 6 cases, all with good results. Supporting bandage as only treatment: 3 cases. In the group treated with rest in bed and physiotherapy there are several cases in which the disease is bilateral to this extent, that slipping of the epiphysis is pronounced on one side, slight on the other, and in which only the worse hip has been treated actively. Often the results obtained in this group have

been credited to the conservative treatment, while it might just as rightly be claimed that the results are ascribable to the *early* treatment, not to conservative treatment.

The extension treatment may be reckoned under either therapy, active and conservative. If reposition is the aim—as in wire-extension or in the method given by *Wardle* (38)—the treatment is active, whereas *Waldenström* (36) does not aim at any correction with his extension treatment. Surprisingly few late results have been reported after these methods. *Waldenström* states merely that until 1930 he had treated 24 patients with extension, without observing necrosis of cartilage (arthrosis) in any of them afterwards; as he fails to give any particular data, his cases could not be included in Table 1.

Summing up these observations it may be said that while the results from manipulation can be estimated with a fair degree of accuracy, there would be no corresponding certainty in judging of the other methods. It has to be admitted that these results are not strikingly good, but—it might be, perhaps, that the prognosis hitherto has been made too favourable. One cannot argue against the employment of active treatment in severe cases merely by referring to the circumstance that mild cases may get along after less radical methods.

Whatever the treatment may be, the outcome of epiphysiolysis cap. fem. will be premature closure of the epiphyseal line. Thus, even in mild cases the zone of growth is damaged to such an extent that it disappears. The closure itself is the only sure guarantee against secondary slipping.

From what has been stated here, it is evident that the question about the treatment of slipping epiphysis of the femur has not been settled yet. Still, it seems fairly reasonable to assume that employment of the bloodless reposition will be justified also in future. Were I to outline its field of serviceability it would be:

1) In acute traumatic cases.
2) In recent cases (it is not possible to set in a definite time-limit). If the slipping is not corrected by gentle manipulation, further attempts ought to be given up.

In case of very slight slipping, bandaging may suffice; more marked degrees of slipping ought presumably to be treated operatively (as I have had no personal experience in this field, I shall leave the choice of operation an open question).

Subtrochanteric osteotomy is a good operation in old cases with faulty position of the extremity.

SUMMARY

An account is given of the therapeutic results in 13 recent and 11 old cases of epiphysiolysis capitis femoris (coxa vara epiphysarea). Among the old cases, 2 presented necrosis of joint-cartilage (arthrosis) after conservative treatment; hence the assertion that this complication is due exclusively to active treatment has to be refuted.

The treatment is discussed on the basis of the results reported in the literature, from which it has been possible to gather 407 late results as published in the last 15 years. In this collective material 207 hips have been treated by manipulation, giving good functional results in 33 %, fair in 24 %, poor in 26 %, and bad in 17 %.

RÉSUMÉ

Rapport sur les résultats thérapeutiques obtenus dans 13 cas frais et 11 cas invétérés d'epiphysiolysis capitis femoris (coxa vara epiphysarea).

Parmi les cas invétérés on trouve 2, où une arthrose grave s'est développée à la suite d'une thérapie conservatrice; par conséquent, il faut rejeter la théorie qui voit dans cette complication uniquement la suite d'un traitement actif.

La thérapie est discutée sur la base des résultats rapportée dans la littérature. Dans les publications des dernières 15 années on a pu rassembler 407 résultats finals. Sur ce nombre un replacement non sanglant est opéré sur 207 hanches; les

résultats fonctionnels obtenus sont caractérisés comme bons (33 %), satisfaisants (24 %), médiocres (26 %), mauvais 17 %.

ZUSAMMENFASSUNG

Die Behandlungsresultate von 13 Patienten mit Epiphyseolysis capitis femoris und von 11 Patienten mit Folgezuständen derselben Leiden werden mitgeteilt. Unter diesen letzten Fällen kommt in zwei Fällen eine schwere Knorpelnekrose nach ausschliesslich konservativer Therapie vor. Die Behauptung, dass diese Komplikation nur als Behandlungsfolge nach aktiver Therapie (Reposition) vorkommt, muss deshalb abgelehnt werden.

Die Behandlung der Femurkopfkappenablösung habe ich diskutiert auf der Basis von 407 Spätresultaten, gesammelt aus der Literatur der letzten 15 Jahre. Von diesen 407 Resultaten sind 207 Hüften mittels unblutiger Reposition behandelt worden, mit 33 % guten, 24 % weniger guten, 26 % unbefriedigenden und 17 % schlechten funktionellen Resultaten.

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