

THE EFFECT OF INTERTROCHANTERIC OSTEOTOMY ON THE VENOUS DRAINAGE OF THE FEMORAL NECK IN PERTHES' DISEASE

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Intraosseous femoral neck venography was performed both pre- and postoperatively on 30 patients with Perthes' disease. At the time of the operation (osteotomy) and the preoperative venographies, the disease was in the initial stage in 16 patients, in the fragmentation stage in eight patients and in the restitution stage in six patients. As shown previously the venous drainage of the femoral neck preoperatively, in the initial and fragmentation stages of the disease, was different from the venous pattern of the healthy (control) hips in every case, indicating an obstruction of the venous flow. 4-15 months after the osteotomies this venous obstruction had disappeared completely or almost completely in most cases. This normalization happened sooner than expected on the basis of our findings with conservatively-treated patients.

Key words: Perthes' disease; venous congestion; intertrochanteric osteotomy

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In Legg-Perthes-Calvé's disease a disturbed venous drainage of the femoral neck, which can be demonstrated by intraosseous venography, occurs both in the initial and the fragmentation stages; however, in the restitution stage the venographies are the same or almost the same as in healthy hips (Suramo et al. 1974).

During the past two years at the Surgical Department of the University of Oulu almost all patients with Perthes' disease have been treated by varus and internal derotation osteotomy (Puranen & Heikkinen 1976). The operative treatment seems to shorten the course of the dis-

ease and yield better results than conservative therapy with Thomas' splint (Axer 1965, Dreyer & Schäfer 1974, Puranen & Heikkinen 1976). It could be that the advantageous effect of osteotomy is related to improvement in the venous circulation in the affected area.

In the present study intraosseous femoral neck venography was performed both pre- and postoperatively on patients with Perthes' disease. On the basis of this investigation attempts were made to obtain information about the effect of osteotomy on the disturbed venous drainage pattern in these patients.

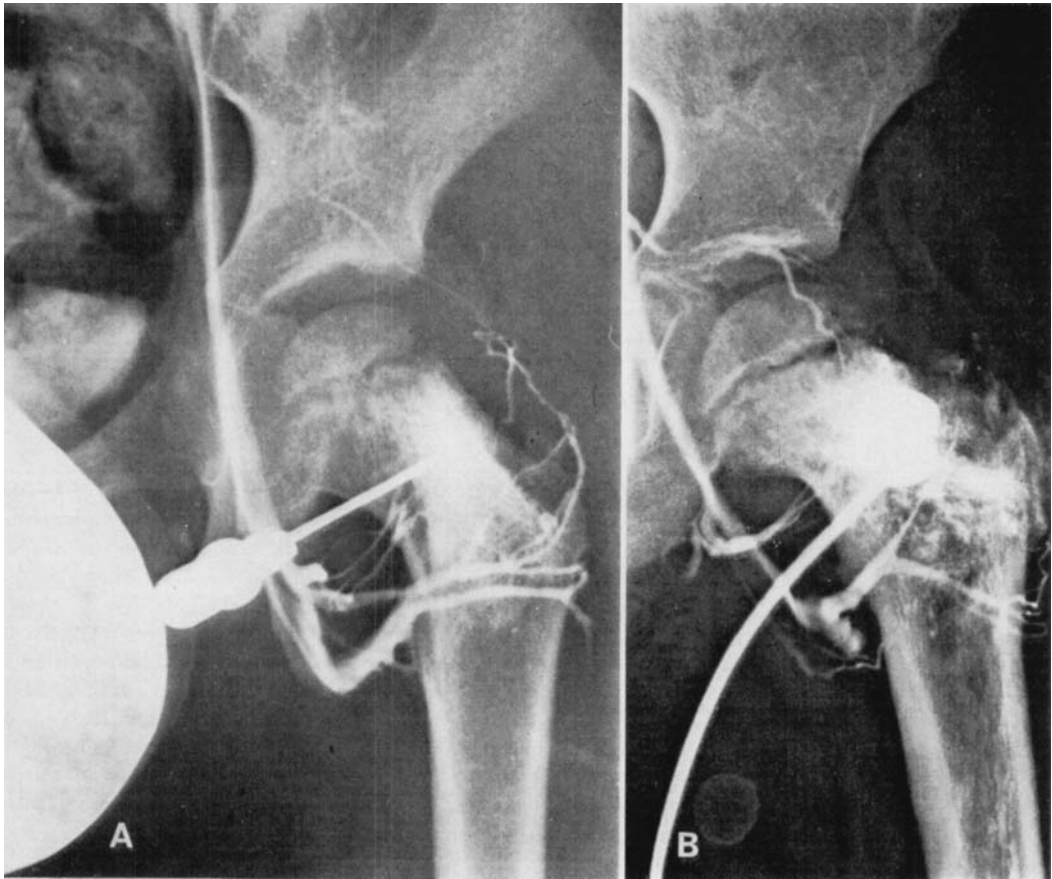


Figure 1. Normal intraosseous venographies.

A: The normal venous drainage of a healthy hip. The contrast medium does not flow into the diaphyseal area; the lateral and medial circumflex veins and the gluteal vein are clearly visualized. B: A normal venous drainage of a hip at the restitution stage of Perthes' disease 18 months after the osteotomy. All the extraosseous venous pathways can be seen. However, the contrast medium has spread to some extent into the diaphysis.

PATIENTS AND METHODS

The material consisted of 30 patients with Perthes' disease. The intraosseous venography of the femoral neck was carried out on all patients preoperatively, and at least once postoperatively. According to the criteria of Jonsäter (1953) and Edgren (1965) the disease was, at the time of the operation, in the initial stage in 16 patients, in the fragmentation stage in eight and in the restitution stage in six patients (Tables 1, 2, 3).

The postoperative venography was usually carried out in connection with the extraction of the fixation plate. However, some of the postoperative venographies were performed at the Department of Radiology. The technique of our

venography has been described in detail previously (Suramo et al. 1974).

The venographic findings were classified into four groups: normal (—), slightly pathological (+), clearly pathological (++) and technically unsuccessful (?).

Normal venography (Figure 1 a, b)

According to our previous studies with 20 healthy hips (Suramo et al. 1974) we considered the intraosseous venography to be normal if contrast medium injected into the femoral neck flowed out through the lateral and medial circumflex veins and the gluteal veins without or with only a very mild diaphyseal reflux. Non-

visualizing of the gluteal vein or veins was accepted as a normal variation.

Slightly pathological venography (Figure 2)

In the venographies classified as slightly pathological (+) the contrast medium always flowed to some extent into the diaphyseal area and at the same time one of the extraosseous venous pathways (usually the gluteal veins) was not visualized.

Clearly pathological venography (Figure 3 a, b)

A venography was clearly pathological (++) if the diaphyseal reflux of the contrast medium was abundant. The assessment was the same when the contrast medium flowed to some extent into the diaphyseal area and at least two extraosseous veins were not visualized.

Technically unsuccessful venography (Figure 4)

The evaluation of the venous drainage was impossible or uncertain if the contrast medium drained under the periosteum or intra- or extracapsularly.

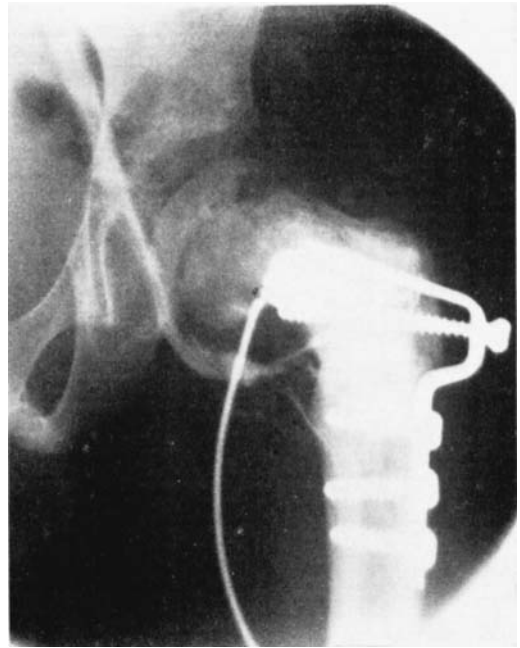


Figure 2. A slightly pathological venography. The patient was operated at the initial stage 4 months prior to the venography. The circumflex veins can be seen, but the gluteal vein is not visualized and the contrast medium flows to some extent into the diaphysis.

RESULTS

Initial stage (Figure 5 a, 5 b)

In the initial stage the preoperative venography was almost always clearly

Table 1. Pre- and postoperative venographies of the patients in the initial stage of Perthes' disease.

Patient	Preoperative venography		First postop. venography		Second postop. venography	
	Duration of symptoms (months)	Findings	Time from operation (months)	Findings	Time from operation (months)	Findings
1	2	++	4	++		
2	6	+	6	+		
3	3	++	7	+		
4	2	++	6	+		
5	5	+	5	—	18	—
6	3	++	16	—		
7	2	++	6	—		
8	1	++	7	—		
9	4	++	14	—		
10	5	++	6	—		
11	3	++	6	—		
12	5	++	8	—		
13	4	+	12	+		
14	6	+	7	—		
15	2	?	13	—		
16	4	?	9	+	18	+

++ = clearly pathological venous drainage.
 + = slightly pathological venous drainage.

— = normal.
 ? = technically unsuccessful.



Figure 3. Clearly pathological venographies.

A: A clearly pathological venous drainage of a hip at the initial stage of Perthes' disease. The lateral and medial circumflex veins are poorly visualized, the gluteal vein fails to show up and the contrast medium spreads abundantly into the diaphysis.

B: A clearly pathological venous drainage in a hip at the fragmentation stage of Perthes' disease. All the extraosseous veins cannot be visualized and the contrast medium flows abundantly into the diaphyseal area.

pathological (Table 1). Only four out of 16 patients had a slightly pathological finding and two had a technically unsuccessful venography. The time interval from the onset of symptoms to the preoperative venography and surgical treatment was, on an average, 3.5 months (range 3–6 months). The period between the operation and the first postoperative venography was, on an average, 8 months (range 4–16 months). Thus the time between the onset of the disease and the

first postoperative venography averaged nearly 12 months.

One patient had a clearly pathological finding 4 months after the operation. His pre- and postoperative venographies were similar. Five patients had a slightly pathological finding postoperatively. Two out of these had a similar venous pattern preoperatively, two had a clearly pathological preoperative venography and one had a technically unsuccessful preoperative venography. The slightly pathologi-

cal venous drainage of the latter patient remained as such also in the second postoperative investigation 18 months after the operation.

Fragmentation stage

In the fragmentation stage the patients showed a clearly pathological preoperative venographic finding (Table 2). The duration of the hip symptoms before the preoperative venography was a little more than 10 months (range 8–16 months). The postoperative venographies were normal with the exception of slightly pathological findings in two patients whose venographies were performed 4 and 5 months after the osteotomy. In these patients the second postoperative venographies 16 and 17 months after the operation were normal.

Restitution stage

In the restitution stage, the preoperative venographies are normal or only slightly pathological (Suramo et al. 1974). For this reason the venographic examinations were carried out postoperatively only on some of the surgically treated patients. Also in this group a slightly pathological finding seemed to



Figure 4. A technically unsuccessful venography. The contrast medium has drained intracapsularly.

be normalized after the osteotomy, and the normal preoperative venography remained normal also postoperatively.

Table 2. Pre- and postoperative venographies of the patients in the fragmentation stage of Perthes' disease.

Patient	Preoperative venography		First postop. venography		Second postop. venography	
	Duration of symptoms (months)	Findings	Time from operation (months)	Findings	Time from operation (months)	Findings
1	8	++	24	—		
2	9	++	4	+	16	—
3	10	++	5	+	17	—
4	16	++	5	—		
5	9	++	5	?		
6	10	++	15	?	25	—
7	11	++	10	—		
8	9	++	11	—		

++ = clearly pathological venous drainage.
+ = slightly pathological venous drainage.

— = normal.
? = technically unsuccessful.

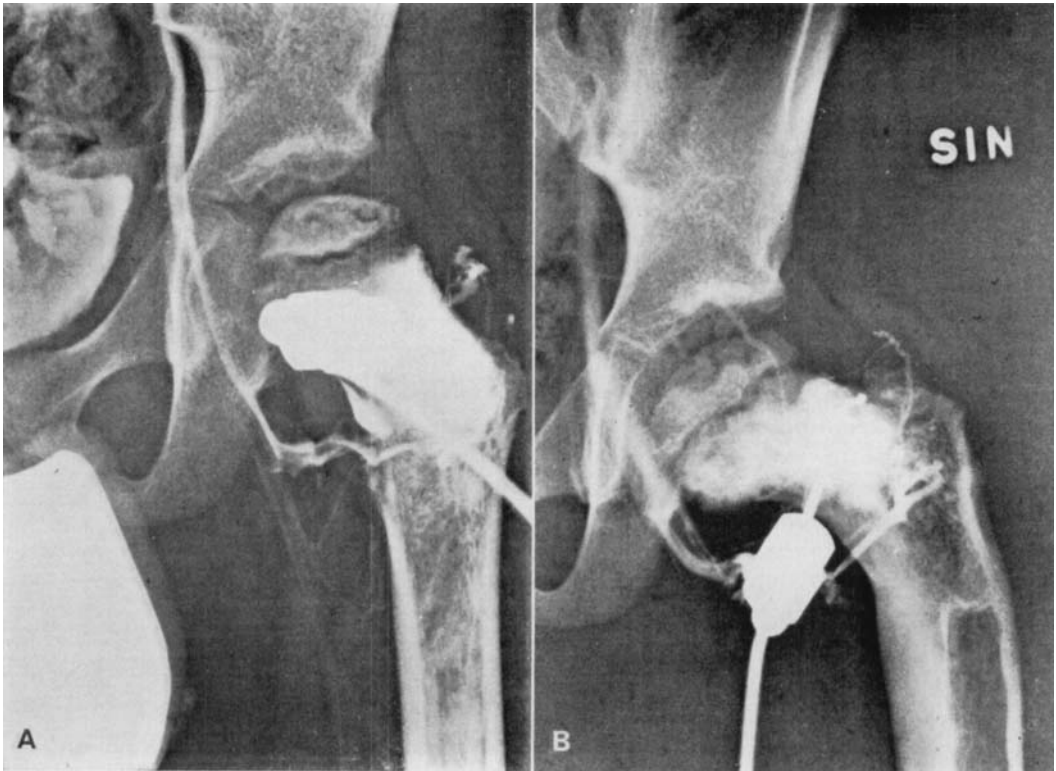


Figure 5. Case 12. Preoperative and postoperative venographies (a boy at the age of 7 years). A: Preoperative venography has been taken at the initial stage. The finding is clearly pathological. B: The same hip 8 months after the operation. The venography is normal, although the gluteal vein cannot be visualized.

Table 3. Pre- and postoperative venographies of the patients in the restitution stage of Perthes' disease.

Patient	Preoperative venography		Postoperative venography	
	Duration of symptoms (months)	Findings	Time from operation (months)	Findings
1	24	+	4	—
2	> 24	—	4	—
3	> 24	—		—
4	> 24	+	5	—
5	> 24	—		—
6	> 24	?	7	+

+ = slightly pathological venous drainage.
 — = normal.

? = technically unsuccessful.

DISCUSSION

In the initial and fragmentation stages of Perthes' disease the venous drainage of

the femoral neck was pathological as reported previously (Suramo et al. 1974). In the pathological venographies the contrast medium injected into the femoral

neck spread to the diaphyseal area; usually the gluteal and sometimes the medial circumflex veins were not visualized and the contrast medium remained in the bone marrow longer than normal. These changes are strongly suggestive of a venous congestion which seemed to decrease during the restitution stage of the disease.

The pathological venous drainage in Perthes' disease corresponds well with the changes found in intraosseous venography in hip arthrosis (Arnoldi et al. 1972). In arthrosis the intraosseous pressure exceeds normal and the effect of the venous circulation on the intraosseous pressure is more important than that of the arterial circulation (Arnoldi et al. 1972). Arnoldi et al. (1972) have also shown that osteotomy decreases the elevated intraosseous pressure and improves venous circulation in coxarthrosis.

Intertrochanteric osteotomies seem to have a favourable effect on the disturbed pattern of venous drainage also in Perthes' disease. In the patients operated on in the initial stage the venous circulation of the femoral neck was usually normal 8–19 months after the onset of symptoms (Table 1), whereas in those treated conservatively or not treated until the fragmentation stage the preoperative venographies were always clearly pathological 8–16 months after the onset of symptoms (Table 2).

Callus formation at the site of consolidating fractures does not inhibit intraosseous flow of contrast medium (Puranen & Kaski 1974). Therefore a consolidated osteotomy could not block the drainage of contrast medium to the femoral diaphysis and normalize our venograms obtained at least 4 months after the operation.

The shortened normalization time of the venous drainage in operated patients corresponds with our clinical and radiological findings regarding a good and fast healing process in Perthes' hip after the osteotomy treatment (Puranen & Heikkinen 1976). Disturbances in the venous circulation probably hold a central position in the pathogenesis of Perthes' disease. Obviously a poor capillary nutrition results from venous engorgement which seems to occur in the degenerative phases of Perthes' disease. Whether venous congestion is a cause of the disease or a consequence of it, remains unsolved. In any case intertrochanteric osteotomy has a favourable effect on both the venous congestion and the course of the disease.

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