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## Intertrochanteric osteotomy in young adults for sequelae of Legg-Calvé-Perthes' disease—a long term follow-up

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**Abstract** Between 1974 and 1999 we performed 15 intertrochanteric osteotomies in 14 patients with a painful hip secondary to Legg-Calvé-Perthes' disease. In seven patients, the osteotomy was combined with advancement of the greater trochanter, acetabular roof plasty, or both. One patient died 5 years after the osteotomy and one patient was lost to follow-up. One patient had a revision osteotomy 21 years after the initial osteotomy, and five patients had a prosthetic replacement 8–25 years after the osteotomy. The average follow-up of the remaining osteotomies was 11.3 years. An intertrochanteric osteotomy can decrease pain and improve clinical function medium and long term without radiological progression of joint degeneration.

**Résumé** Entre 1974 et 1999 nous avons exécuté 15 ostéotomies intertrochantériennes chez 14 malades avec une hanche douloureuse secondaire à une maladie de Legg Calvé Perthes. chez 7 malades l'ostéotomie a été combinée avec avancement du grand trochanter et/ou une plastie acétabulaire. Un malade est mort 5 années après l'ostéotomie et un malade a été perdu de vue. Un malade a eu une ostéotomie itérative 21 années après l'ostéotomie initiale et cinq malades ont eu un remplacement prothétique 8 à 25 années après l'ostéotomie. La moyenne de suivi des autres ostéotomies était de 11,3 années. Une ostéotomie intertrochantérienne peut diminuer la douleur et améliorer la fonction clinique à moyenne et à longue échéance sans progression radiologique de la dégénérescence articulaire.

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### Introduction

Some children affected with Legg-Calvé-Perthes' Disease (LCPD) develop a painful hip in young adulthood. The hips often have a deformed femoral head with a slightly dysplastic acetabulum. In many patients, a leg-length discrepancy coexists. We have used intertrochanteric femoral osteotomy with advancement of the greater trochanter in combination with acetabular plasty for such cases. In this study, we present the long-term results of 14 patients.

### Methods

Between 1967 and 1999, 14 patients with a painful and degenerative hip secondary to LCPD in childhood were seen and operated on by the senior author. Thirteen patients were male. All patients except two had been treated conservatively for their LCPD (Table 1). All patients complained of pain in the affected hip with limited walking distance. Range of motion was generally limited. All patients were contacted for clinical and radiological follow-up and had standard AP pelvic and a lateral hip radiographs. Functional radiographs in abduction and adduction were taken to assess the best position of the femoral head in relation to the acetabulum. Femoral-head deformity was rated according to Stulberg [21]. One hip was graded as class II, five as class III and eight as class IV. Arthrosis was scored according to Tönnis [23]: Nine patients had stage I, four had stage II and one had stage III.

Patients consequently underwent a total of 15 intertrochanteric osteotomies; one patient had bilateral osteotomies within 1 year. The average age at osteotomy was 30.2 (19–55) years. In five patients (six hips), the osteotomy was combined with an acetabular roof plasty and five patients (six hips) had an advancement of the greater trochanter.

### Statistical methods

Survival rates were used to compare results with other studies and was calculated until a total hip replacement or an arthrodesis of the affected joint was performed. Harris hip score and radiographs were used to evaluate outcome and arthrosis progression.

**Table 1** Patients and procedures

Number	Gender	Age at osteotomy	Previous surgery	Stulberg class	Modification of intertrochanteric osteotomy	Acetabular plasty	Advancement of greater trochanter
1	M	19		III	Valgus, extension	Yes	Yes
2	F	26	Debridement at 13 yrs., osteotomy at 19 yrs.	III	Valgus, internal rotation	No	No
3	M	22		IV	Valgus, medialisation	No	No
4	M	22		IV	Valgus	Yes	Yes
5	M	23		III	Valgus	Yes	Yes
6	M	24		IV	Valgus, medialisation	No	No
7	M	24		IV	Valgus	Yes	Yes
8	M	26		II	Valgus, internal rotation, Lengthening	No	No
9	M	27		IV	Valgus	No	Yes
10	M	28		III	Valgus	No	No
11	M	33		n.a.	Valgus	No	No
12	M	35	Osteotomy at 13 yrs.	IV	Valgus	Yes	No
13	M	40		IV	Valgus, extension	No	No
14	M	49		III	Varus	Yes	No
15	M	55		IV	Valgus, medialisation	No	Yes

**Table 2** Follow-up

Number	Complications	Secondary osteotomy after <i>n</i> years	THR after <i>n</i> years	Survival (years)	Type of re-osteotomy	Hip score at follow-up	Osteoarthritis grading pre-op.	Osteoarthritis grading at follow-up
1				15		87	2	2
2				4		61	1	1
3	#1		25			n.a.	1	n.a.
4				10		86	1	1
5				9		74	1	1
6				25		61	2	3
7		21		24	Valgus, internal rotation	93	1	3
8				4		75	1	1
9		#3		5		n.a.	2	1
10				13		91	1	1
11	#2	No follow-up		n.a.		No follow up	n.a.	n.a.
12		4	10		Varus, internal rotation, advancement of greater trochanter	n.a.	1	n.a.
13				8		n.a.	3	n.a.
14				22		n.a.	1	n.a.
15				11		n.a.	2	n.a.

#1 Adductor contracture

#2 Fistula with *S. aureus*, severe intra-articular bleedings due to neglected haemophilia

#3 Died 5 years after the initial osteotomy

## Results

One patient was lost to follow-up and one died 5 years after the initial osteotomy (Table 2). Post-operatively, one patient developed a contracture of the adductor muscles, which needed a tenotomy. Another patient with haemophilia A developed severe intra-articular bleedings post-operatively, an infection, and a fistula that needed debridement. Two patients had a second intertrochanteric osteotomy 4 and 21 years after their initial osteotomy, of which one eventually proceeded to a total hip replacement (THR) 10 years after the initial osteotomy. Another four patients needed a total hip replacement 8, 11, 22 and 25 years after the initial osteotomy. In total, five of 14 patients needed a THR. No arthrodesis was performed.

The average survival time of all the osteotomies was 15.2 (8–25) years. The average survival time of the nine osteotomies in the eight patients in whom no THR was performed was 11.3 (4–25) years. All patients but one had a significant pain reduction 1 year post-operatively. In one patient, the pain remained unchanged after the first osteotomy, but a second osteotomy 4 years later significantly reduced the pain. At the last follow-up, a Harris hip score was taken of all the patients in whom their own hip joint was still intact. The average Harris hip score in these patients was 78.5 (range 61–93). The range of motion did not improve in the long term, except in one patient. The average pre-operative flexion was 111°; at maximum follow-up this was 95°. The extension changed from an average of –4° to –1°; only two patients had a

flexion contracture at maximum follow-up (5 and 25°). The average pre-operative abduction was 7°; this improved to 15°. The adduction changed from 22° pre-operatively to 14° at maximum follow-up. Arthrosis subsided in one patient from stage II to stage I at 6 years. Arthrosis increased in one patient from stage I to stage III at 25 years of follow-up, and this patient was on the waiting list for receiving a THR at the time of this report. In one patient, the arthrosis changed from grade 2 to grade 3 in 25 years. Radiographs of all other patients showed no arthrosis progression at the latest follow-up.

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## Discussion

Although total hip replacement is generally a good option for osteoarthritis; the life expectancy for patients with sequelae after LCPD is much longer than that of a prosthetic implant. Furthermore, joint-preserving surgery improves the quality of life in the short and medium term while still leaving the possibility of a THR at an older age [13].

After LCPD, deformation of the femoral head is usually multi-directional, flat or broad in the frontal plane and phaloid in the axial direction. The femoral neck may be in varus, the greater trochanter stands high and a leg-length discrepancy may exist. Furthermore, the acetabulum may be slightly dysplastic and in many cases has lost its normal anteversion. Joint-preserving surgery is focused on either the acetabulum or the femoral head and is based on improvement of the forces within the hip or on improving joint congruency [1, 13].

The femoral head can be adjusted using an intertrochanteric osteotomy [10, 12, 17, 18, 19] or advancement of the greater trochanter [9] or both [7, 13]. Options for treatment on the acetabular side are Salter-type osteotomies [13, 25], rotational acetabular osteotomies [6, 8, 15, 22, 26] and augmentation procedures like acetabular roof plasty [11, 13, 16, 24]. In many cases, it is necessary to address both the acetabulum and the femoral head [1, 5, 14].

Intertrochanteric osteotomy is a logical procedure to address hip deformities after LCPD. However, there are no studies describing long-term results of osteotomies in young adults with sequelae after LCPD. Maistrelli et al [10] described patients with osteoarthritis of the hip treated with valgus extension osteotomy at an average age of 51 years. They showed good long-term results in young patients with a “mechanical” secondary osteoarthritis. Unfortunately, the aetiology of the secondary osteoarthritis was not specified. Baksi [2] was successful in treating painful hips by using cheilectomies without osteotomies in combination with adductor tenotomy. The acetabular side was not addressed. It is obvious that hinging and impingement could be improved by using such techniques. However, the additional drilling and revascularisation attempts seem illogical.

Other authors claim that secondary arthrosis in young adults is best treated with a femoral osteotomy in

combination with an acetabular re-directing osteotomy [1, 5, 14]. Koyama et al [8] looked into the specific problem of osteoarthritis secondary to LCPD in young adults. Fourteen patients with an average age of 33 years were treated with a Chiari osteotomy, in four patients combined with an intertrochanteric osteotomy, and evaluated after an average of 6.3 years. He found post-operative improvement of pain but no improvement of range of motion. In all but one patient, the progression of arthrosis was halted. No hip joint had any prosthetic replacement. However, the follow-up was only 2–12 years.

In contrast to the general belief in, and the solicitors' need for, “cookery book surgery”, our focus has been to adapt surgery to the need of the individual patient. We tried to address all facets of the pathology, which in many cases lead us to complex, combined procedures. In all patients, an intertrochanteric femoral osteotomy was deemed necessary. The type of osteotomy was assessed individually on a radiological basis. A valgus osteotomy was the most used procedure. Not only did it improve congruency, it also has the advantage that leg-length discrepancy, hinging and impingement can be addressed [3, 4, 9, 13, 17, 20]. In cases where the abduction forces needed addressing, even after a valgus osteotomy, the possibility of an advancement of the greater trochanter was chosen [7, 13]. Although three-dimensional reconstruction CT scans are currently used for evaluation of hip joint deformities, this modality was not yet available in the era during which most of the operations were performed.

To address acetabular dysplasia, we used a procedure of the acetabular roof. Acetabular dysplasia usually exists on the lateral and posterior side. We could place bone grafts and cancellous bone wherever there was a need for it. A Salter osteotomy seems illogical as it only addresses the lateral and anterior side of the acetabulum [13, 25]. A Chiari osteotomy will address especially the lateral side, but also the anterior and posterior side [8]. In comparison, rotational osteotomies are complex and difficult [15, 22, 26]. However, development of the peri-acetabular procedures is now a good alternative to our more classic technique.

We conclude that our treatment of sequelae of LCPD is a valuable option, delaying the need for THR without compromising necessary bone stock. We were able to show that this concept, addressing femoral and acetabular deformities, can decrease pain, improve clinical function in the medium and long term and prevent (further) degeneration of the hip in relatively young adults.

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