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## Full weight-bearing after cementless total hip arthroplasty

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**Abstract** In a prospective study of cementless total hip arthroplasty, 19 hips in 17 patients (Group A) were allowed full weight-bearing immediately after the operation while 18 hips in 16 patients (Group B) were first allowed weight-bearing after 6 weeks. Patients were matched for sex, age at surgery, height, weight, and follow-up period and there were no significant differences in hip scores between the two groups. Rehabilitation to gain walking ability with a cane lasted 5.8 days for Group A and 44.8 days for Group B ( $P=0.0001$ ). The hospital stay after surgery was 30.1 days for Group A and 46.7 days for Group B ( $P=0.006$ ). All patients showed bone ingrowth radiographically. There were no complications in either group.

**Résumé** Dans une étude prospective d'arthroplastie totale de la hanche non-cimentée, 19 malades (19 hanches) (Groupe A) ont eu l'autorisation de pratiquer un appui complet immédiatement après l'intervention tandis que 18 malades (18 hanches) (Groupe B) l'ont fait après 6 semaines. Les malades ont été appariés en regard du sexe, de l'âge à la chirurgie, de la taille, du poids, et de la durée du suivi. Il n'y avait pas de différence significative en ce qui concerne les scores du fonctionnement de la hanche entre les deux groupes. La durée de rééducation nécessaire pour obtenir la capacité de marche à l'aide d'une canne était de 5,8 jours pour le Groupe A et de 44,8 jours pour Groupe B ( $P=0.0001$ ). La durée de séjour à l'hôpital après l'intervention était de 30,1 jours pour le Groupe A et de 46,7 jours pour le Groupe B

( $P=0.006$ ). Nous avons constaté chez tous les patients une fixation osseuse à la radiographie. Il n'y avait aucune complication dans les deux groupes.

### Introduction

In protocols for rehabilitation following cementless total hip arthroplasty (THA), protected weight-bearing for 6 weeks after surgery is generally recommended [9]. It was thought that early weight-bearing might increase micromotion and result in fibrous ingrowth at the implant–bone interface [2, 12, 24]. Several reports have indicated, however, that early weight-bearing after cementless THA showed no negative influence on clinical results or implant stability [21, 22]. Full weight-bearing immediately after surgery has several benefits, including a shorter hospital stay, lower hospitalization cost, and an earlier return to work.

We have been using a spongy metal Lübeck hip prosthesis since 1987 and this prosthesis has given satisfactory medium-term results [17, 23] when partial weight-bearing was started 6 weeks after surgery and full weight-bearing at 12 weeks. The purpose of the present study was to clarify the effect of full weight-bearing immediately after surgery using the same uncemented hip prosthesis.

### Patients and methods

Between April 1993 and October 1995, 33 patients with 37 hips received an uncemented total hip arthroplasty. The patients were randomly divided into two groups: Group A consisted of 17 patients with 19 hips who were allowed to bear full weight on the second day after operation. Group B consisted of 16 patients with 18 hips who were instructed to maintain touchdown weight-bearing until 3 weeks after surgery, then increase partial weight-bearing over the next 3 weeks and bear full weight 6 weeks after surgery. Patients were matched for sex, age at surgery, height, weight, and follow-up period (Table 1).

All patients received a spongy metal Lübeck hip prosthesis. The acetabular and femoral components are made of a co-

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**Table 1** Demographic data

	Immediate full weight-bearing group (Group A)	Late full weight-bearing group <sup>a</sup> (Group B)	<i>P</i> -value <sup>b</sup>
Number of patients/hips	17/19	16/18	
Sex (F/M)	11/6	12/4	0.554
Age (years)	52.0±13.0 (33.0–77.0) <sup>c</sup>	51.0±12.0 (28.0–75.0) <sup>c</sup>	0.964
Height (cm)	158.0±9.6 (144.0–176.0) <sup>c</sup>	156.0±8.6 (143.0–174.0) <sup>c</sup>	0.796
Weight (kg)	59.0±11.0 (45.0–80.0) <sup>c</sup>	58.0±9.1 (43.0–73.0) <sup>c</sup>	0.903
Disease (osteoarthritis/osteonecrosis)	10/9	13/5	0.291
Follow-up (years)	5.1±0.4 (4.4–5.7)	5.4±0.8 (4.4–6.5)	0.114

<sup>a</sup> Patients were not permitted full weight-bearing until 6 weeks after surgery

<sup>b</sup> Mann-Whitney U test

<sup>c</sup> Mean±SD (range)

**Fig. 1** Radiograph of a 50-year-old man in the full weight-bearing group (Group A), who had a left total hip arthroplasty for osteonecrosis. Anteroposterior radiograph (A) and lateral radiograph (B) 6 years after surgery, showing stable bony position



balt–chrome–molybdenum alloy and the entire surface has a structure like cancellous bone. The acetabular component has two spikes wedged into the anterior and posterior areas of the acetabular rim and one peg embedded in the ischium.

The patients were evaluated clinically before surgery, then again at 3 months, at 6 months, and at the latest follow-up using the Merle d'Aubigne hip scoring system [18]. Each patient was allowed to leave the hospital when he or she could perform daily activities without assistance and had gained sufficient confidence that he or she could perform the activities at home. The duration of the hospital stay after surgery and the duration of rehabilitation to gain the ability to walk with a cane were recorded. In addition, patients were monitored for such complications as fracture, dislocation, symptomatic deep venous thrombosis, and infection.

The fixation of the acetabular and femoral components was assessed radiographically according to the Engh criteria [10]. Anteroposterior and lateral radiographs obtained by a standard tech-

nique were taken after surgery at 1 week, 6 months, 1 year, and annually thereafter. An independent orthopaedic surgeon evaluated our radiographic findings. Acetabular component migration was defined as a change of more than 2 mm in any direction or a change of more than 5° in the abduction angle [4, 14, 25]. Femoral component subsidence was defined as a change of more than 4 mm [23]. Radiolucent lines were evaluated on the femoral side as described by Gruen [11] and on the acetabular side as described by DeLee and Charnley [6]. Osteolysis was also evaluated at each zone and defined by focal lytic lesions adjacent to components [7]. The fill proportion of the intramedullary canal was measured 1 cm below the lesser trochanter and 1 cm above the tip of the stem on the anteroposterior radiograph taken 1 week after surgery [23].

Statistical analysis was performed using the Mann-Whitney U test; a *P* value of less than 0.05 was considered significant.

## Results

There was no statistical difference in stem size of the prosthesis between the groups. The fill proportion measured below the lesser trochanter ranged from 83% to 100% (mean, 93%) for Group A and from 83% to 100% (mean, 92%) for Group B. The fill proportion measured above the stem tip ranged from 86% to 97% (mean, 93%) for Group A and from 83% to 97% (mean, 92%) for Group B. There was no statistical difference in prosthesis fit between the two groups. Intraoperative fracture did not occur.

Merle d'Aubigne hip scores (mean) for Group A were 9.6 (6–13) before surgery, 16.1 (12–17) at 3 months, 17.7 (16–18) at 6 months, and 17.7 (16–18) at the most recent follow-up. Hip scores for Group B at the same time points were 8.8 (4–12), 16.3 (14–17), 17.2 (15–18), and 17.2 (15–18). There were no significant differences between the groups. Neither group reported any postoperative thigh pain. The mean duration of the hospital stay was 30.1 days (range, 22–39 days) for Group A and 46.7 days (range, 30–94 days) for Group B. In Group A, five patients stayed in the hospital for more than 30 days: two lacked confidence in their ability to perform daily activities after leaving the hospital, one had a bad cold, one needed heart monitoring for transient tachycardia, and one had lower back pain. The mean duration of rehabilitation to gain walking ability with a cane was 5.8 days (range, 4–10 days) for Group A and 44.8 days (range, 42–50 days) for Group B ( $P=0.0001$ ). There were no incidences of postoperative fractures, dislocation, symptomatic deep venous thrombosis, or infection in either group.

All patients showed bone ingrowth radiographically (Figs. 1). There were no incidences of acetabular component migration, stem subsidence, or osteolysis in either group at any time. Radiolucent lines were seen in four hips in Group A: one in zone 1 on the acetabular side, two in zone 1 on the femoral side, and one in zone 7 on the femoral side. Radiolucent lines were seen in five hips in Group B: one in zone 1 on the acetabular side, one in zone 2 on the acetabular side, and three in zone 1 on the femoral side. All radiolucent lines were less than 1 mm wide.

## Discussion

It has been thought that unprotected weight-bearing soon after cementless THA might increase the micromotion of the components and result in fibrous fixation at the implant–bone interface [1, 2, 19, 20, 24]. More recently, Jasty has reported that bone ingrowth was detected in a dog femur even though micromotion exceeded 50  $\mu\text{m}$  [13]. Rao et al. [21] and Ritter et al. [22] reported satisfactory clinical and radiographic results in patients who were allowed full weight-bearing immediately after surgery. From their clinical experience several authors sup-

port the concept of full weight-bearing immediately after a cementless THA on the condition that proper design fit and fill of the components are achieved [5, 8, 15, 21, 22].

A medium-term comparative study of the effects of full weight-bearing immediately after surgery has not been reported to date. In this study, bone ingrowth was demonstrated radiographically in all patients regardless of the group. No initial femoral component subsidence was seen. No failure was seen radiologically in any patient at the most recent follow-up.

The duration of the hospital stay has varied with national character, insurance systems, and economic circumstances. Our study demonstrated that full weight-bearing immediately after cementless THA could dramatically shorten the hospital stay. In addition, full weight-bearing immediately after surgery has been reported to prevent deep venous thrombosis [3, 16]. Our results support this: no symptomatic deep venous thrombosis was found in this study.

Full weight-bearing immediately after cementless THA shortened the rehabilitation process and the hospital stay without radiographic migration of the components or clinical complications.

**Conflict of interest statement** No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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