

THE INFLUENCE OF RADIATION THERAPY ON THE HARRIS HIP SCORE IN CEMENTLESS TOTAL HIP ARTHROPLASTY

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Heterotopic ossification may adversely influence the outcome of total hip arthroplasty, causing discomfort or limiting the range of motion and function of the hip. In this prospective study we examined the influence of prophylactic radiation therapy on the postoperative Harris Hip Score in cementless total hip arthroplasty, with a follow-up from 2 to 5 years. Radiation therapy lowered the incidence of unsatisfactory results and increased the Harris Hip Score in hips with a poor pre-operative range of motion.

Keywords : cementless ; Harris Hip Score ; hip ; heterotopic ossification.

Mots-clés : prothèse non cimentée ; Harris Hip Score ; ossifications hétérotopiques.

INTRODUCTION

Several authors reported more than a 50% incidence of radiographically visible heterotopic ossification and up to a 30% incidence of clinically significant heterotopic ossification (3, 5, 6, 10, 11, 15, 18, 19, 20, 22, 23, 24, 27, 28). More specifically, heterotopic ossification may cause a reduction in range of motion (ROM) and an increase in pain, discomfort or disability after surgery. In some severe cases, the patient may actually have less function than before the total hip replacement. It appears that in cementless total hip replacement, heterotopic ossification occurs even more frequently (17).

Several investigators have recommended as preventive measures against heterotopic ossification :

NSAID's (6, 9, 21, 22, 25, 29), biphosphonates (2, 12, 28) and radiation therapy (1, 8, 14, 15, 16, 26). Although the adverse effect of heterotopic ossification on the result of total hip arthroplasty is well known, no publications could be found on the influence of radiation therapy on the clinical outcome in groups of patients with cementless total hip replacement.

In this study we compared the results, according to the Harris Hip Score (HHS), in two analogous groups of patients with cementless total hip arthroplasty, with and without postoperative radiation therapy to prevent heterotopic ossification (table I). The results of radiation therapy on the formation of heterotopic ossification in these patients with cementless total hip arthroplasty, have been published by the authors in this journal in 1994 (15).

Table I. — Material
154 cementless hips, type Zweymüller

	hips	women	men	mean age
No radiation	79	54	25	64
Radiation	75	53	22	65

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MATERIAL AND METHODS

The investigation includes 154 cementless total hip prostheses type Zweymüller (30), inserted between January 1987 and December 1990, in patients with osteoarthritis of the hip. Sixteen patients had both hips replaced during the same period. All cemented or hybrid prostheses or cementless prostheses other than the Zweymüller were excluded. Also omitted were patients with previous operations, such as revision arthroplasty, and patients with primary diseases that may influence the formation of heterotopic ossification adversely (hypertrophic osteoarthritis, ankylosing spondylitis) or beneficially (rheumatoid arthritis). Sixteen charts were rejected: 2 hips with a postoperative fracture due to an accident, 3 with postoperative dislocation and 11 charts with incomplete data.

All of the operations were performed by the same surgical team, using the same operative (anterolateral, transgluteal) approach.

The study was prospective, but for practical and organizational reasons it was not randomized. From January 1987 through August 1988 and from August 1989 through January 1990 no prevention for heterotopic ossification was used. From September 1988 through July 1989 and from February 1990 through December 1990 radiation therapy was used. A total dose of 1,000 cGy was administered in five fractions of 200 cGy starting before the fifth day after surgery.

The diagnosis of heterotopic ossification was achieved primarily with xrays. Radiographs were obtained immediately after the operation, 4 months and one year after surgery (15). Any visible ossification around the area of the hip was graded according to the classification of Brooker *et al.* (4).

The clinical outcome of total hip arthroplasty was estimated according to the HHS (13), measured preoperatively and postoperatively, with a follow-up from 2 to 5 years.

All data were recorded clinically and considered nominal or ordinal. Statistical analysis included the 2×2 *Chi square test* for proportions, the *Mann-Whitney test* for comparison of mean and the *Rank test* for equal variances, the level being set at 0.05 (7).

A postoperative HHS of less than 80 was considered to be an unsatisfactory result.

RESULTS

Seventy-five hips were irradiated and 79 were not. In the 75 hips with radiation therapy, the

mean postoperative HHS was 95 (49 preoperatively), while in the 79 hips without irradiation the mean HHS was graded 92 (47 preoperatively) (tables II and III).

Postoperatively, the HHS increased in all patients, but the increase did not differ significantly between the two global groups (Mann-Whitney test: -0.8373 ; n.s.).

However, of the unsatisfactory results (HHS < 80), there were 2 (3%) unsatisfactory result in patients with radiation therapy and 11 (14%) in patients not irradiated (table IV). There is a significantly higher risk of unsatisfactory results in the group not irradiated (Chi square 6.30; $p < 0.025$).

Table II. — Mean Harris Hip Score Preoperative

	total	pain	function	ROM
No radiation n = 79	47	20	22	5
Radiation n = 75	49	21	23	5

Table III. — Mean Harris Hip Score Postoperative

	total	pain	function	ROM
No radiation n = 79	92	41	43	8
Radiation n = 75	95	43	43	9

Table IV. — Unsatisfactory results = HHS < 80
No radiation (n = 79) Radiation (n = 75)

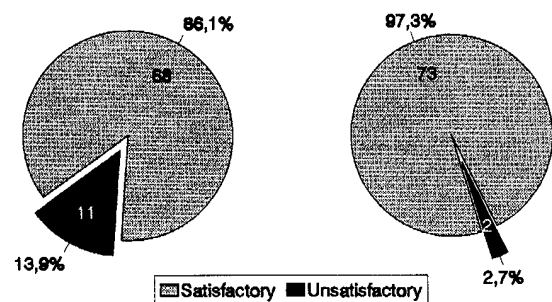
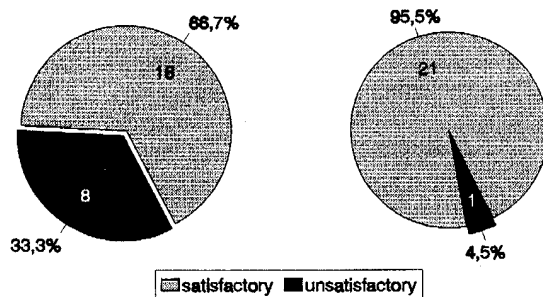


Table V. — Mean Harris Hip Score
Preoperative ROM = < 3

	No radiation n = 24	Radiation n = 22
preoperative	41	40
postoperative	85	95

Table VI. — Unsatisfactory results
in hips with preoperative ROM = < 3
No Radiation (n = 24) Radiation (n = 22)



Of the 154 hips, 46 showed a preoperative ROM ≤ 3 , according to the HHS. Twenty-two of them were treated postoperatively with radiation therapy and 24 received no prophylactic measures for heterotopic ossification.

After irradiation the mean postoperative HHS was 95 (40 preoperatively) and without radiation 85 (41 preoperatively) (table V). When restricted to this group of hips with poor preoperative ROM, the increase in HHS owing to the operation is significantly higher in the irradiated hips (Mann-Whitney - 2.5645 ; $p < 0.02$). Only 1 (5%) unsatisfactory result was found in patients with radiation therapy and 8 (33%) were found in patients not irradiated (table VI). This difference also achieves significance (Chi-square 6.04 ; $p < 0.025$).

DISCUSSION

The authors realize the potential problems of the method in this trial : sequential series rather than randomization. However sequential series were preferred for safety and efficiency on the ward : it was feared that randomization would complicate daily routine, imposing a hazard for both the patients and the trial.

On the other hand, no factors for bias could be seriously taken into account : patients were not selected in any way, to be in one or the other group. Both groups were similar with respect to sex and age (table I). Statistically, the distribution of the preoperative HHS was analogous in both groups (Mann-Whitney : - 1.3132 ; n.s. ; Rank test : 1.1271 ; n.s.), and the same was true for the group of hips having ROM ≤ 3 .

Though less impressive than the reduction of radiographically detectable heterotopic ossification (15), the results of the HHS show the clear advantage of postoperative irradiation in reducing the incidence of unsatisfactory results from 14% to 3%. In hips with a poor preoperative ROM, radiation therapy increased the HHS by 11 points.

Sixty-two percent of the unsatisfactory results occurred in only 24 hips, which is 16% of the total number of total hip replacements. These hips presented a poor preoperative ROM and were not treated postoperatively with irradiation. The postoperative HHS of hips with a poor preoperative ROM, but with radiation therapy (40-95), did not differ from the other hips (49-95).

Although radiation therapy undoubtedly results in lesser heterotopic ossification in these series (15), the influence on the clinical outcome of cementless total hip replacement appears particularly apparent in hips with poor preoperative ROM and possibly in other patients with high risk factors for the development of heterotopic ossification.

Nevertheless radiation therapy seems to decrease the unsatisfactory outcome in all hips and can therefore be advocated after cementless total hip replacement. This preventive treatment is especially attractive if one single dose is effective (16), which is the subject of another trial in our department.

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SAMENVATTING

L. LINCLAU, G. DOKTER, J. M. DEBOIS, P. GUTWIRTH. De invloed van röntgentherapie op de Harris Hip Score bij cementloze heup arthroplastiek.

Het optreden van peri-articulaire calcificaties kan een ongunstige invloed hebben op het klinisch resultaat van totale heupprothesen, door het optreden van pijn of een beperkte beweeglijkheid en functie.

In deze prospectieve studie werd de invloed van radiotherapie ter preventie van peri-articulaire calcificaties onderzocht, op de postoperatieve Harris Hip Score bij cementloze totale heupen, met een follow-up van twee tot vijf jaar.

Radiotherapie vermindert het aantal resultaten met een onvoldoende score en verbetert de Harris Hip Score bij heupen met een slechte preoperatieve beweeglijkheid.

RÉSUMÉ

L. LINCLAU, G. DOKTER, J. M. DEBOIS, P. GUTWIRTH. Influence de la radiothérapie sur l'évaluation des prothèses de hanche non cimentées, selon les critères de Harris.

Les ossifications hétérotopiques peuvent influencer défavorablement le résultat des arthroplasties totales de hanche, en provoquant soit douleur, soit limitation fonctionnelle.

Dans cette étude prospective, les auteurs ont étudié l'influence de la radiothérapie préventive sur les résultats des prothèses non cimentées de hanche, d'après les critères de Harris ; leur follow-up s'échelonne entre 2 et 5 ans.

La radiothérapie a diminué l'incidence des résultats médiocres et a amélioré l'évaluation d'après les critères de Harris dans les hanches fort enraidies en préopératoire.