Heterotopic bone formation following hip arthroplasty

A retrospective study of 65 bilateral cases

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Heterotopic bone formation after two-stage bilateral cemented total hip arthroplasty was evaluated in 65 patients (23 women and 42 men) who had not received treatment with anti-inflammatory drugs in the immediate postoperative weeks. The mean age at the first operation was 65 years, and the median interval between the two arthroplasties was 3 months. Fifty-two patients developed heterotopic ossification after the initial hip arthroplasty. Of these patients, 40 also developed ossifications after contralateral hip arthroplasty. Out of 11 males developing Grade-III heterotopic ossification after the initial hip arthroplasty, 8 also developed Grade-III ossification after contralateral hip arthroplasty. Two females developed Grade-III ossification after the initial arthroplasty, but neither of them developed a Grade-III lesion after contralateral total hip arthroplasty. Males with Grade-III heterotopic ossification after the initial hip arthroplasty were shown to be at a high risk of developing the same severe lesion after contralateral total hip arthroplasty, making them candidates for postoperative prophylaxis.

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Patients with heterotopic bone formation after replacement of one hip have been reported to have a high probability of developing the lesion to the same or to a more severe degree after contralateral total hip arthroplasty (DeLee et al. 1976, Sodemann et al. 1988). Therefore, heterotopic bone formation after total hip arthroplasty is by some considered to be an indication for prophylactic measures when the patient returns for contralateral total hip arthroplasty.

The aim of the present study was to investigate the relation between the degree of heterotopic bone formation after initial and subsequent contralateral total hip arthroplasty in view of selection of patients for prophylaxis.

Patients and methods

Totally, 153 consecutive patients who were treated with two-stage bilateral total hip arthroplasty at our hospital between September 1969 and November 1982 were evaluated as regards heterotopic bone formation. The study only included cases treated for primary coxarthrosis without previous hip surgery. Eighty-eight patients who received anti-inflammatory drugs during the first 2 postoperative weeks were excluded, leaving 65 patients (23 women and 42 males) for further analysis. All the patients underwent a cemented Charnley arthroplasty by a lateral transtrochanteric approach. The median interval between the two joint replacements was 3 (1–82) months. The mean age at the initial replacement was 65 (47–77) years.

The degree of heterotopic bone formation was assessed radiographically according to DeLee et al. (1976) from anteroposterior radiographs obtained at the latest follow-up examination (Table 1). Only central ossifications were evaluated (Kjærsgaard-Andersen et al. 1990b).

Data were analyzed using Fisher's test of exact probability (Swinscow 1981). *P*-values below 0.05 were considered significant. Because it is evident from the literature that gender influences the development of the lesion, a statistical analysis was performed separately for the female and male patients.

Table 1. Grading of heterotopic bone formation around the hip according to DeLee et al. (1976)

Grade 0	No formation of heterotopic bone
Grade I	Heterotopic bone occupying less than 50 percent of the distance between the femur and pelvis
Grade II	Heterotopic bone occupying more than 50 percent, but does not bridge the distance between the femur and pelvis
Grade III	Bridging heterotopic bone

Table 2. Grade of heterotopic bone formation after initial and contralateral total hip arthroplasty in 23 women

Initial	Contralateral				
	0	I	II	III	Total
0	4	4	0	0	8
I	2	4	3	0	9
II	0	2	1	1	4
III	1	1	0	0	2
Total	7	11	4	1	23

Table 3. Grade of heterotopic bone formation after initial and contralateral total hip arthroplasty in 42 men

Initial	Contralateral				
	0	I	II	III	Total
0	1	2	1	1	5
I	7	5	4	3	19
II	2	3	0	2	7
III	0	2	1	8	11
Total	10	12	6	14	42

Results

Fifty-two of the 65 patients developed heterotopic ossification after the initial total hip arthroplasty. Of these patients, 40 also developed heterotopic ossification after contralateral hip arthroplasty. Heterotopic ossification was more frequent ($P = 0.03$) in the males than in the females (Tables 2 and 3). Eight of the 11 males who developed Grade-III heterotopic ossification after the first hip replacement also developed high-grade heterotopic ossification after subsequent contralateral total hip arthroplasty ($P = 0.002$). In contrast, neither of the 2 females who developed high-grade ossification at the initial total hip arthroplasty did so after the contralateral operation.

Discussion

Some studies have reported on heterotopic bone formation after bilateral total hip arthroplasty (Nollen and Slooff 1973, DeLee et al. 1976, Ritter and Vaughan 1977, Kromann-Andersen et al. 1980, Lindholm et al. 1986, Sunderam and Murphy 1986, Sodemann et al. 1988, Kilgus et al. 1990). Among these, only Sodemann et al. (1988) evaluated patients without treatment with anti-inflammatory drugs in the postoperative period. They concluded that the extent of heterotopic ossification in the two replaced hips was strongly correlated.

In the present study, males with a Grade-III lesion after the initial total hip arthroplasty were recognized as having a high risk of developing that same extent of the lesion at contralateral total hip arthroplasty, whereas such a correlation could not be demonstrated for females. This accords with the results published by Sodemann et al. (1988). However, in contrast to these authors, we could not demonstrate any correlation between other degrees of the lesion at surgery in the two hips. Because Grade-III heterotopic bone formation is the only lesion interfering with the clinical outcome of the arthroplasty (Schmidt et al. 1988), the present study suggests that males developing Grade-III heterotopic bone formation after the initial total hip arthroplasty should receive prophylaxis when undergoing contralateral total hip arthroplasty. Other patients at risk are males with hypertrophic arthrosis, severely restricted hip motion, ankylosing spondylitis, Forestier's disease, and revision total hip arthroplasty. These patients have been shown to develop the most severe degree of the lesion more frequently than others, and therefore should also receive postoperative prophylaxis (Kjærsgaard-Andersen and Schmidt 1991).

Heterotopic bone formation after total hip arthroplasty can be prevented by postoperative treatment with anti-inflammatory drugs for the first 2 to 6 weeks (Kjærsgaard-Andersen and Schmidt 1986, Schmidt et al. 1988, Kjærsgaard-Andersen and Ritter 1990b) or by single-dose irradiation of the hip during the first postoperative week (Hedley et al. 1989, Lo et al. 1988).

In the early postoperative period after a total joint replacement, more patients will receive anti-inflammatory medication for treatment of postoperative pain or degenerative diseases in other joints. In the present study and the study by Sodemann et al. (1988), the basic incidence of heterotopic bone formation after a total hip arthroplasty was relatively high. However, both studies have only evaluated patients who did not receive postoperative treatment

with anti-inflammatory medicaments. This strengthens the necessity for taking this factor into account when evaluating the incidence of heterotopic ossification in total hip arthroplasty materials (Schmidt et al. 1988, Kjærsgaard-Andersen et al. 1990a, Kjærsgaard-Andersen et al. 1990b).

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