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Extopic bone after hip replacement

Excision and free fat transplants in four cases

In four patients ectopic bone formed after total hip replacement was replaced with free fat transplants. One year later the patients were free from pain, and hip flexion had increased by 60 degrees on average. Ectopic bone was completely absent in one patient, and markedly reduced in the remaining three patients. Bone scintigraphy was found to be a sensitive technique to reveal early ectopic bone formation. Fat transplantation seems to be a satisfactory complement in the treatment of ectopic bone.

Sven-Olof Abrahamsson
Sven-Arne Ahlgren
Jan Anders Dahlström[1]
Per Ohlin[1]
Leif Stigsson[2]

Departments of Orthopedics, [1]Clinical Physiology and [2]Diagnostic Radiology, Helsingborg Hospital, S-251 87 Helsingborg, Sweden

The incidence of ectopic bone formation (EBF) after total hip replacement varies between 8 and 53 per cent (Lazansky 1973, Nollen & Slooff 1973, Slooff & van Berkel 1973, Spranger 1973, Matos et al. 1975, Jowsey et al. 1977, Ritter & Vaughan 1977). Severe ossification is less common; its frequency varies between 1 and 13 per cent (Brooker et al. 1973, Lazansky 1973, Matos et al. 1975, Jowsey et al. 1977). Surgical excision of the ectopic bone is rarely indicated; Jowsey et al. (1977) reported only 11 out of 3204 hips (0.3 per cent).

Surgical removal of the ectopic bone implies a high risk of recurrence (Nolan et al. 1975, Fahmy & Wroblewski 1982, Ritter & Gioe 1982). Therefore the excision of bone has been combined with administration of diphosphonate (Bijvoet et al. 1974), radiation (Coventry & Scanlon 1981), indomethacin (Lidgren & Nordström 1979, Ritter & Gioe 1982) and autogenous free fat transplants (Riska & Michelsson 1979). We have used the latter method in four cases of severe EBF.

Patients and methods

Patients. Four male patients aged 52–63 years with primary coxarthrosis had had total hip replacement, two conventional (CAD, Harris) and two resurfacing (Wagner) arthroplasties. Postoperatively the range of motion in the operated hips was markedly restricted (Table 1), and two patients also complained of slight pain when walking. Radiography revealed severe EBF. When the new-formed bone had developed into a well-circumscribed piece with some trabecular structure, excision of ectopic bone and fat transplants was performed 14 (7–19) months after the arthroplasty operation.

Surgical procedure and postoperative care. At operation the ectopic bone was excised as completely as possible until flexion reached at least 90 degrees. Fat was taken from the edges of the wound and wrapped around the head and neck of the prosthesis/femur to form a cuff extending from the pelvis to the base of the neck. The transplants were secured with sutures and checked to ensure that they remained in place when the hip was moved.

Prophylaxis against infection and thrombosis was given. Physiotherapy was started on the day after surgery and continued during the hospital stay and after discharge. Every day the hip and the knee on the operated side were flexed as close to 90 degrees as possible, placed on pillows and kept in that position for some hours; this position was recommended by Gshwend (1980) for rheumatoid knees after synovectomy.

Radiography and bone scintigraphy. Repeated radiographic examinations were performed in frontal and lateral views. The extent of the ectopic bone was measured, and its location and attachment to the fe-

Table 1. Patients treated with excision of ectopic bone and free fat transplants (FFT) after total hip replacement (THR). The sum of motion includes flexion-extension, ad-abduction and rotation in the hip

Case	Arthroplasty	Interval THR-FFT (months)	Degrees of flexion		Degrees of sum of motion		Follow up time (months)
			Preop.	At latest follow-up	Preop.	At latest follow-up	
1.	CAD, Harris	7	15–30	5–70	30	115	12
2.	CAD, Harris	12	10–40	0–85	30	160	15
3.	Wagner	19	10–25	0–100	45	210	12
4.	Wagner	19	0–50	0–90	110	175	12

mur and/or pelvis were noted. The structure of the ectopic bone was also evaluated.

Radionuclide imaging of the hips was performed with a Searle LFOV gamma camera with an all-purpose parallel hole collimator. Four hours after injection of about 370 MBq ^{99m}Tcm-methylene diphosphonate (MDP) (Osteolite, New England Nuclear, Mass. USA), images in anterior and posterior views were acquired, containing about 400 000 counts.

Evaluation of ectopic bone was performed in the hip images. Furthermore, digital analysis was performed by calculating counts in rectangular regions of interest (ROI) in the same images. The size of the ROI was selected to include all ectopic bone. The upper part of the femur, adjacent parts of the pelvis and background were also included in this ROI, which was identical in the sequential images in one patient. For comparison, a similar ROI was selected for the contralateral side and the uptake ratio was calculated.

Follow-up. Clinical examinations were performed 1.5, 3, 6 and 12 months postoperatively in all patients and also at 15 months in one patient. Scintigraphic examinations were performed 1 and 2 weeks, and 1, 2 and 6 months postoperatively in three patients. In these patients radiographic examinations were usually performed simultaneously. In one patient radiographic examinations were performed after 1 day, and 8 and 15 months postoperatively.

Results

Clinical. In all patients the postoperative course was without signs of infection, haematoma, nerve injury, dislocation or thromboembolism. Three patients were very satisfied with the operation and one was fairly satisfied. All were free of pain, and all had substantially increased hip motion. The sum of all motions averaged 54 (30–110) degrees before operation and 165 (115–210) degrees at the latest follow-up. Flexion increased from 28 (15–50) degrees to 85 (65–100) degrees (Table 1).

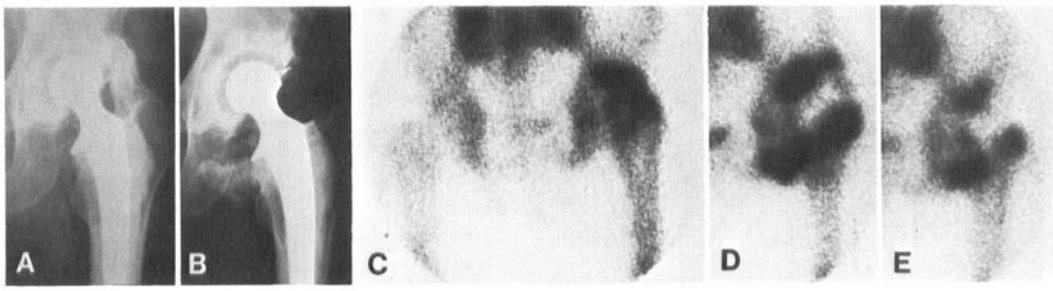

Figure 1. Case 1 had severe ectopic bone formation 7 months after CAD total hip replacement.
A. Severe ectopic bone located between the major trochanter and acetabulum and close to the femoral neck with attachment to femur and pelvis.
B. 12 months after the excision operation, moderate ectopic bone had recurred mainly near the minor trochanter and inferior to the femoral neck without attachment to femur or pelvis.
C. Scintigraphy of the hips in posterior view before the excision operation. High uptake laterally and superiorly to the left hip.
D. Left hip scintigraphy 2 weeks after ectopic bone excision. Increased uptake is seen superiorly to the hip and in the trochanter region.
E. Six months after ectopic bone excision high uptake mainly seen at the minor trochanter.

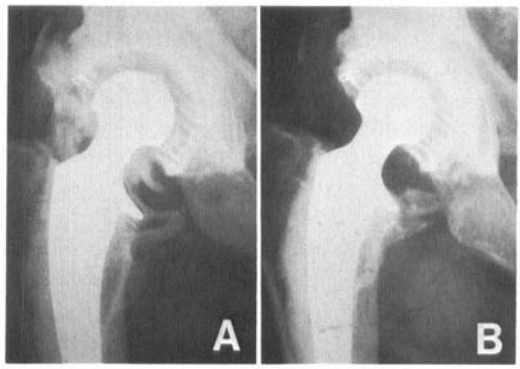

Figure 2. Case 2 had severe ectopic bone located around the femoral neck with attachment to pelvis 1 year after total hip replacement.
A. Before excision of the ectopic bone.
B. Nine months after excision, only mild recurrence of ectopic bone mainly adjacent to the minor trochanter.

Radiography and bone scintigraphy. The grade of ossification preoperatively (Jowsey et al. 1977) was severe in all four hips (Figures 1 and 2). Postoperatively, the corresponding grades were moderate in one and mild in two; one patient had no ossification.

Preoperatively, the ectopic bone was located superiorly and posteriorly to the neck of the prosthesis, while the recurrence was more peripheral to the prosthesis and mainly adjacent to the minor trochanter.

The earliest sign of ectopic bone, revealed by radiographic examination, was noted 4 weeks postoperatively in one patient (Case I). The extent of this new ectopic bone was mainly unchanged during the late follow-up.

Computer tomography examinations failed to identify the transplanted fat, mainly because of disturbances from the metal.

Bone scintigraphy showed no abnormal ^{99m}Tcm-MDP uptake in Case 3 and just a dot in Case 4 after 6 months (Figure 3). In Case 1 ectopic bone was found preoperatively superiorly and posteriorly to the neck of the prosthesis (Figure 1). One week after excision of the ectopic bone, increased uptake was found mainly inferiorly to the neck. This uptake increased markedly posteriorly the following week but then decreased (Figure 1). Six months after the excision, new ectopic bone was present at the minor trochanter.

Discussion

The tendency to EBF is probably constitutional since unilateral ossification seems almost never to occur after bilateral arthroplasties (Slooff & van Berkel 1973, Dahl 1975, De Lee et al. 1976). However, Kromann-Andersen et al. (1980) found no convincing correlation between EBF in the two operated hips among 45 patients. In our Case 2 the contralateral hip later had an arthroplasty with fat transplants as EBF-prophylaxis. Only mild ectopic bone developed and the clinical result was excellent. This may encourage a wider use of fat transplants as prophylaxis in patients at high risk of developing ectopic bone.

EBF after arthroplasty is first visible after 3 weeks and will always appear within 6 months (De Lee et al. 1976, Ritter & Vaughan 1977, Jowsey et al. 1977). The amount of ectopic bone is stabilized between 6 weeks and 12 months (De Lee et al. 1976, Ritter & Vaughan 1977). In the present series the recurrence of ectopic bone was first noted radiographically between 4 and 6 weeks; the amount was mainly constant during the late follow-up.

In Case 1, recurrence of EBF was identified

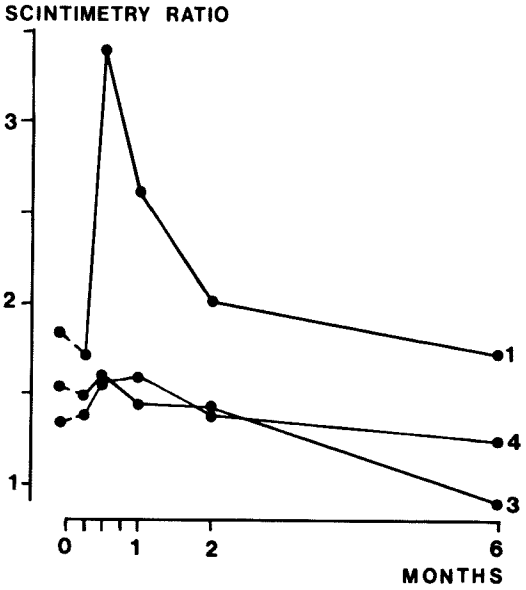

Figure 3. The uptake ratio of ^{99m}Tcm-MDP in the affected and nonaffected hips related to time after excision of the ectopic bone in Cases 1, 3 and 4. The values, before zero time represent the preoperative ratios.

by increased ^{99m}Tcm-MDP uptake 2 weeks postoperatively. At that time no radiographic signs of EBF could be found. Thus, bone scintigraphy seems to reveal EBF earlier than radiography. The high uptake after 2 weeks decreased rapidly in this patient, and between 2 and 6 months the abnormal uptake was stable (Figure 3). This may indicate stabilization of EBF.

Riska & Michelsson (1979) seem to have been the first to use fat transplants as prophylaxis against recurrence of EBF after surgical excision. They classified their results as good or excellent but did not give any figures for the range of motion pre- and postoperatively. In the present study the same method gave excellent results in three patients and a good result in one. The range of motion increased markedly and all were free of pain. When ectopic bone did form, the amount was much reduced postoperatively and located more peripherally. This new location may indicate development outside the fat transplants, which seem to inhibit EBF. The careful postoperative regimen with physiotherapy and positioning of the operated leg may also contribute to good results. The less favourable result in one patient may perhaps be explained by too early surgical treatment.

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