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Feasibility of outpatient management after intra-articular yttrium-90: comparison of two regimens

P L WILLIAMS, J C W CRAWLEY, A M FREEMAN, D C LLOYD, J M GUMPEL

Abstract

In a study comparing two regimens of treatment after intra-articular irradiation of the knee with yttrium-90 one group of patients was allocated to bed rest for 48 hours in hospital and the other to mobilisation at home. Initially a Robert-Jones orthopaedic bandage was applied to the knee in all patients, serving as a semi-rigid splint, but as loss of isotope from the knee was appreciable in the mobilised patients, subsequent patients were sent home with the knee in a plaster-of-Paris cylinder.

No difference in extra-articular spread or chromosomal damage was found between the patients sent home with their knee in a rigid splint and those treated by bed rest. Clinical outcome at three months was satisfactory in all three groups.

These results show that rigid splinting is essential in reducing extra-articular spread of the isotope but that bed rest is not necessary. Increases in intra-articular pressure associated with quadriceps muscle activity combined with flexion of the knee may be the most important factor affecting extra-articular spread of isotope.

Introduction

Immobilising the knee after intra-articular injection of radioisotope reduces extra-articular spread of isotope, in particular to the regional lymph nodes,[1 2] and decreases the incidence of chromosomal damage in peripheral blood lymphocytes.[1 3-5] In practice this has necessitated admitting all patients to hospital for bed rest for at least three days after injection. In a recent study,[6] however, no difference in leakage of isotope or chromosomal damage was found between inpatients confined to bed and those fully mobile in hospital with a rigid splint applied to the treated knee. We carried out the present study to ascertain whether mobilisation at home was acceptable and compared three regimens—namely, bed rest in hospital, mobilisation at home with a Robert-Jones orthopaedic bandage applied to the knee, and mobilisation at home with a plaster-of-Paris cylinder applied to the knee.

Northwick Park Hospital and Clinical Research Centre, Harrow, Middlesex HA1 3UJ

P L WILLIAMS, MB, MRCP, medical registrar
J C W CRAWLEY, CENG, MIEE, MRC scientist
A M FREEMAN, MB, DPHYSMED, research assistant
J M GUMPEL, FRCP, consultant physician

National Radiological Protection Board, Harwell, Didcot, Oxfordshire

D C LLOYD, PHD, head, cytogenetics group

Patients and methods

Twenty-nine intra-articular injections of yttrium-90 silicate were performed on 27 patients with persistent synovitis of the knee (27 single injections, two repeat injections). The synovitis was part of classical or definite rheumatoid arthritis in 14 patients, osteoarthritis in two, and psoriatic arthritis in one; in nine patients the synovitis was confined to one or both knees, while one patient had pigmented villonodular synovitis. The injection dose in each case was 5 mCi, except in the patient with pigmented villonodular synovitis, who received 8 mCi.

Initially, suitable patients were allocated at random to one of two treatment groups. In both groups a Robert-Jones orthopaedic bandage was applied to the knee immediately after injection, but one group remained in bed in hospital for 48 hours while the other was allocated to mobilisation at home for 48 hours, the bandage serving as a semi-rigid splint. All patients were admitted for assessment the day before injection; the mobilised group went home by car or minicab within two hours after injection. Loss of isotope from the knees was greater in the mobilised group, so that subsequently all suitable patients were sent home with the knee in a plaster-of-Paris cylinder, which served as a rigid splint. The plaster was applied 24 hours before injection, from high on the thigh to just above the ankle, with an aperture to permit access to the knee. The results in those patients were compared with the results in the patients treated with bed rest.

A quantitative hybrid whole-body scanner[7] was used to detect leakage of isotope from the knee immediately and 48 hours after injection. The retention of isotope in the knee at 48 hours was expressed as a percentage of that present immediately after injection.

Cultures of peripheral blood lymphocytes were prepared by a routine procedure[8] and analysed for chromosomal damage in patients who had not received previous irradiation. Samples were taken before and at least six weeks after injection and 200 cells scored each time.

Synovitis of both knees and generalised disease activity were assessed clinically immediately before treatment and three, six, and 12 months later. Knee circumference 1 cm above the patella and minimum heel-buttock distance were recorded, and estimates made of the degree of synovial proliferation, effusion, lateral and anteroposterior stability, extension loss, and valgus or varus deformity. Patients were asked to record their symptoms on each visit. General disease activity was assessed by recording the presence or absence of synovitis in other joints and by measuring grip strength and walking time.

All the patients in the mobilised group were given a questionnaire on which to record any difficulties encountered during the two days spent at home and their preferences about treatment.

Results

No difference in retention of isotope in the knee at 48 hours was found between those patients kept in bed in hospital and those sent home with their knee in a plaster-of-Paris cylinder (fig 1). In the group sent home with the knee in a Robert-Jones orthopaedic bandage, there was significantly greater extra-articular spread ($p=0{\cdot}01$, Wilcoxon test). The table shows the mean retentions for each group.

Cytogenetic data before and after injection were obtained on eight patients treated with bed rest, five mobilised with a Robert-Jones orthopaedic bandage, and six mobilised with a plaster-of-Paris cylinder. In the remaining cases either the patients had received previous irradiation or one or both lymphocyte cultures failed. The mean net increases in dicentrics after treatment were 0·2, 0·4, and 0·1/100 cells/mCi for the three groups (table, fig 2).

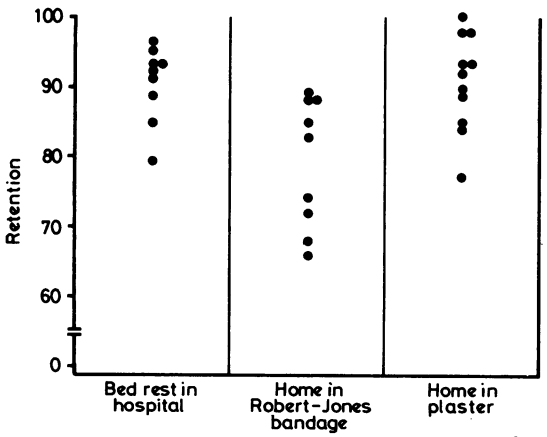

FIG 1—Retention of yttrium-90 in knee 48 hours after injection (as percentage of that immediately after injection).

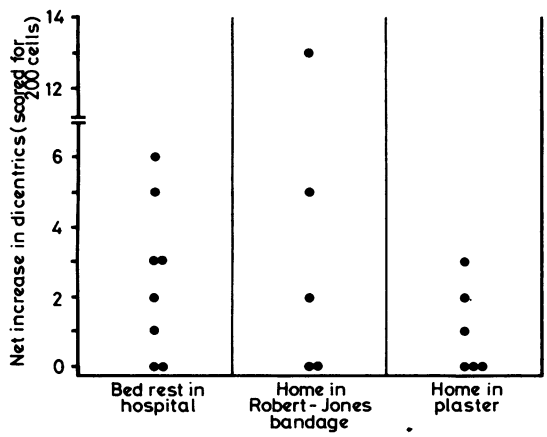

FIG 2—Chromosomal damage in peripheral blood lymphocytes expressed as net increase in dicentrics in 200 cells six weeks after treatment.

Mean retention of isotope, lymph-node uptake, and increase in dicentrics 48 hours after treatment in each group

	Bed rest in hospital	Home in Robert-Jones bandage	Home in plaster
Mean (and median) retention of isotope in knee at day 3 (% of retention immediately after injection)	90·4 (92) (n = 9)	79·2 (83) (n = 9)	90·8 (92) (n = 11)
Mean lymph-node uptake (and range) at day 3 (% of whole body count immediately after injection)	1·0 (0·1–2·4) (n = 9)	2·2 (0·6–7·4) (n = 9)	1·2 (0–3·2) (n = 11)
Mean increase in dicentrics (and range) after treatment/100 cells/mCi	0·2 (0–5) (n = 8)	0·4 (0–13) (n = 5)	0·1 (0–3) (n = 6)

Results of clinical assessment three months after injection showed that in the nine patients treated with bed rest the synovitis had partially resolved in five, remained constant in two, and deteriorated in one, while rheumatoid arthritis had worsened in one. In six patients sent home with the knee in a non-rigid splint the synovitis had partially resolved in four, remained constant in one, and deteriorated in one. In the 11 patients sent home with the knee in a rigid splint the synovitis had resolved completely in two and partially in eight, while in one there had been a generalised worsening of the rheumatoid arthritis.

All but two of the 18 patients sent home (two of whom were treated twice, both times at home) were content with outpatient treatment. The two who would have preferred to stay in hospital noted difficulty climbing stairs and using the toilet, and loosening of the plaster causing some soreness around the ankle.

Discussion

Several conclusions may be drawn from this study. Firstly, rigid splinting of the knee in mobilised patients is essential to reduce extra-articular spread of the isotope. Secondly, bed rest is not essential, and hospital admission may be reserved for those patients whose circumstances require it rather than for all patients requiring intra-articular radiotherapy. Finally, splinting the leg appears to be unnecessary in inpatients confined to bed, since we found no difference between the control group in this study, who were confined to bed with the knee in a semi-rigid splint, and the control group in our previous study,[6] whose knees were bandaged with a light crêpe bandage. A preliminary assessment showed that the clinical outcome in the three groups in this study was satisfactory, particularly since resolution of synovitis after injection of yttrium-90 may take more than three months.

Serendipitously, this work threw light on a topic of controversy —namely, the relative importance of several factors putatively affecting extra-articular spread of isotope. The relative size of colloidal particles, the stability in vivo of the radiocolloids, and, as intra-articular hydrocortisone given before injection may modify spread, the degree of synovitis, have all been considered but have remained unproved, as the differences have not reached statistical significance. Our finding of a significant difference between rigid and semi-rigid splinting suggests that the most important factor may be the increases in intra-articular pressure associated with the activity of the quadriceps muscle combined with flexion of the knee.

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