RADIOGRAPHIC FOLLOWUP OF JOINTS INJECTED WITH TRIAMCINOLONE HEXACETONIDE FOR THE MANAGEMENT OF CHILDHOOD ARTHRITIS

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Evidence of deleterious effects following intraarticular injection of triamcinolone hexacetonide was sought through a review of radiographs of 145 joints of 55 children with chronic arthritis. Possible deleterious effects were noted in 16 joints of 11 patients. These effects included: small patella (2 joints), patellar osteochondritis dissecans (1 joint), periarticular calcification (9 joints), intraarticular tibial bony spur (1 joint), avascular necrosis of the distal radial epiphysis (2 joints), and avascular necrosis of the proximal femoral epiphysis (1 joint). Only the latter possible complication was symptomatic. Serial radiographs of 76 joints of 30 children showed mild progressive changes compatible with the underlying disease, except in the hip joint, where changes were more severe. The intraarticular injection of triamcinolone hexacetonide is a procedure that appears to be associated with an acceptably low frequency of radiologic abnormalities for many joints in children with chronic arthritis, but its effects on the hip joint remain uncertain.

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In 1986, we reported on the efficacy of intraarticular triamcinolone hexacetonide (TH) injections in controlling arthritis of the knee in children (1). We demonstrated that in 45% of the knees with persistent arthritis, the arthritis was still in remission 12 months after the injection of intraarticular TH. Subsequent reports have supported these conclusions (2,3). We have increasingly used this technique for other joints, injecting several joints at once and injecting the same joint on more than 1 occasion. Because of the concern about possible side effects of this treatment, including periarticular calcification and osteonecrosis, we have reviewed the radiographs of children who have received this treatment. As a result of this study with 1–9 years of followup, we conclude that intraarticular TH is an acceptably safe therapy that seldom leads to unexpected radiographic changes, even after repeat injections in the same joint.

PATIENTS AND METHODS

Patients. We reviewed the medical records and radiographs of all children with chronic arthritis attending the pediatric rheumatology clinics of British Columbia's Children's Hospital and the Arthritis Center who had 1 or more joints injected with triamcinolone hexacetonide between 1980 and 1987. Followup radiographs of 145 injected joints of 55 children were obtained; radiographs of 29 knee joints of 20 children were not available. The age, sex, diagnosis, joint injected, and duration of followup for these children with chronic arthritis (with and without followup radiographs) are shown in Table 1. Serial radiographs from the date of first injection to followup were available for 76 joints of 30 children. The radiographic outcome for each of these joints is shown in Tables 2 and 3.

Thirty-seven patients fulfilled the American Rheumatism Association revised criteria for the diagnosis of juvenile

Table 1. Demographic data of children with chronic arthritis treated with intraarticular triamcinolone hexacetonide*

	With followup radiographs	Without followup radiographs
Patients	55	20
Female/male	34/21	17/3
Pauciarticular-onset JRA	24	14
Polyarticular-onset JRA	11	1
Systemic-onset JRA	2	0
Spondylarthropathy	10	3
Juvenile psoriatic arthritis	7	2
Systemic lupus erythematosus	1	0
Joints injected	145	29
Hips	18	0
Knees	75	29
Ankles	22	0
Subtalars	4	0
Shoulders	4	0
Elbows	11	0
Wrists	11	0
Age at first injection, mean years (range)	8.5 (1.2–19)	13.1 (2–19)
Duration of followup, mean years (range)	3.5 (0.8–8.6)	4.6 (1.9–7)

* JRA = juvenile rheumatoid arthritis.

rheumatoid arthritis (4). Ten patients had a spondylarthropathy, which was either seronegative enthesopathy arthropathy syndrome (5) or ankylosing spondylitis (6). Seven patients had juvenile psoriatic arthritis (7), and 1 patient had systemic lupus erythematosus (8).

All children had been treated with nonsteroidal antiinflammatory drugs for at least 3 months before joint injection. The majority had received a trial of aspirin and at least 1 other nonsteroidal antiinflammatory drug.

Triamcinolone hexacetonide was selected for the study because of its reported superiority to betamethasone injections in the knees of children with pauciarticular juvenile chronic arthritis (3) and its superiority to either prednisolone t-butyl acetate or methylprednisolone acetate in the knees of adults with rheumatoid arthritis (9). The dose of triamcinolone hexacetonide injected was ~1 mg/kg of body weight for large joints (shoulders, hips, and knees) and 0.5 mg/kg of body weight for smaller joints (elbows, wrists, ankles, and subtalar joints). The injection was performed after antiseptic preparation of the skin, using 1% lidocaine without epinephrine for local anesthesia. No joint was counted more than once if repeat injections were performed in that joint.

Table 2. Radiographic grades in children with chronic arthritis treated with intraarticular triamcinolone hexacetonide*

Joint injected	n	Preinjection grade					Postinjection grade				
		0	1	2	3	4	0	1	2	3	4
Hip	12	2	2	3	5	0	0	1	2	4	5
Knee	34	8	13	10	3	0	8	11	10	3	2
Ankle	13	2	7	1	3	0	1	5	3	4	0
Subtalar	3	0	3	0	0	0	0	3	0	0	0
Shoulder	3	1	0	2	0	0	1	0	2	0	0
Elbow	4	0	2	1	1	0	0	1	2	1	0
Wrist	7	0	1	0	6	0	0	1	0	6	0

* Serial radiographs of 76 joints (30 children) were available for analysis. Radiographic grades: 0 = no abnormality; 1 = osteopenia only; 2 = mild joint space narrowing with osteopenia, with or without epiphyseal overgrowth and bony squaring; 3 = moderate joint space narrowing, with or without small erosions or osteophytes; 4 = marked joint space narrowing and moderate or large erosions.

Table 3. Change in radiographic grades in children with chronic arthritis treated with intraarticular triamcinolone hexacetonide*

Joint injected	n	Change in radiographic grade from injection to followup				Duration of followup (years)
		0	A	B	C	
Hip	12	5	3	1	3	4.0
Knee	34	28	6	0	0	3.4
Ankle	13	10	1	2	0	2.1
Subtalar	3	3	0	0	0	4.5
Shoulder	3	3	0	0	0	5.2
Elbow	4	3	1	0	0	2.8
Wrist	7	7	0	0	0	1.8

* Serial radiographs of 76 joints (30 children) were available for analysis. Change in grades: 0 = no change; A = 1-grade deterioration; B = 2-grade deterioration; C = 3-grade deterioration.

General anesthesia was administered to children with flexion deformities that required casting, or to those in whom it was anticipated that joint injections would be excessively stressful. No attempt was made to immobilize joints after injection, except when correcting flexion contractures.

Radiographic assessment. Radiographs were evaluated by at least 1 pediatric rheumatologist and 1 pediatric radiologist. Any unusual changes were considered to be possibly due to the intraarticular TH injection. For serial evaluation, each joint was graded on a 0–4 scale as follows: 0 = no abnormality; 1 = osteopenia only; 2 = mild joint space narrowing with osteopenia, with or without epiphyseal overgrowth and bony squaring; 3 = moderate joint space narrowing, with or without small erosions or osteophytes; 4 = marked joint space narrowing and moderate or large erosions (Table 2). Changes over time were graded as follows: 0 = no change in grade; A = a 1-grade deterioration (i.e., a change from grade 0 to grade 1 or from grade 3 to grade 4); B = a 2-grade deterioration; C = a 3-grade deterioration (Table 3). All radiographs reviewed were from patients with injected joints; no attempt was made to "blind" the assessors to injection status by including radiographs of uninjected joints.

RESULTS

There were differences between the groups of patients with and without followup radiographs (Table 1). The group without followup radiographs was younger, had less polyarticular disease, had only their knee joints injected with intraarticular TH, and would

Table 4. Complications possibly due to treatment with intraarticular triamcinolone hexacetonide in children with chronic arthritis*

Patient/sex	Diagnosis	Complication	Joint injected	Duration of followup (years)
1/F	Pauciarticular-onset JRA	Small patella	Left knee	5.0
2/M	Pauciarticular-onset JRA	Small patella	Left knee	2.5
3/M	Pauciarticular-onset JRA	Osteochondritis dissecans of the patella	Right knee	4.5
4/F	Juvenile ankylosing spondylitis	Calcification	Right knee	2.9
5/F	Polyarticular-onset JRA	Calcification	Both ankles	3.0
6/F	Juvenile psoriatic arthritis	Calcification	Left ankle	2.6
7/F	Polyarticular-onset JRA	Calcification	Both ankles	2.9
8/M	Polyarticular-onset JRA	Calcification	Both ankles	1.3
9/M	Polyarticular-onset JRA	Calcification	Right subtalar	4.6
		Avascular necrosis of both distal radial epiphyses	Both wrists	4.6
10/M	Juvenile ankylosing spondylitis	Small intraarticular bony spur of the right tibia	Right knee	3.1
11/M	Systemic-onset JRA	Avascular necrosis of the femoral epiphysis	Right hip	2.7

* JRA = juvenile rheumatoid arthritis.

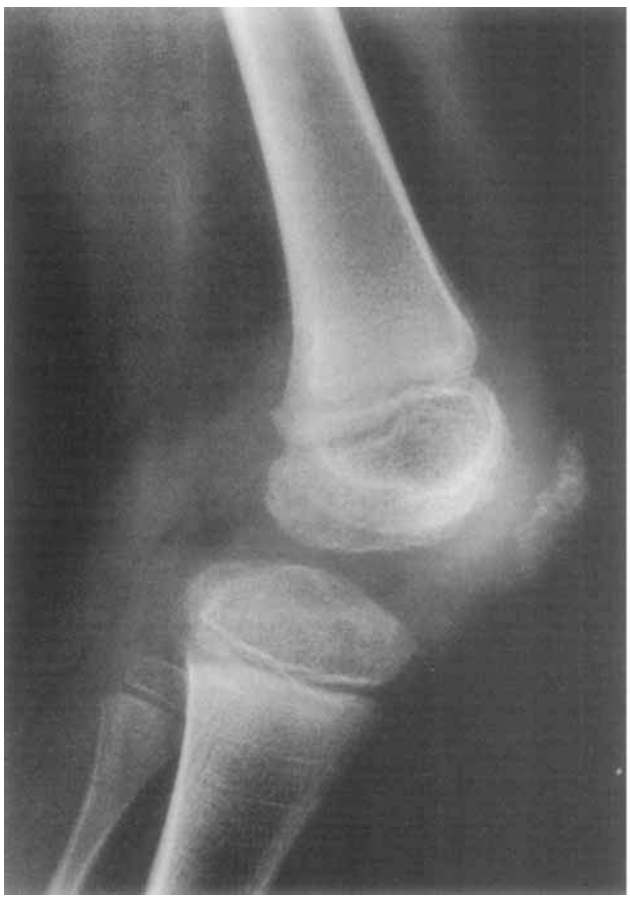

Figure 1. Radiograph of a knee, showing a small, abnormally ossifying patella.

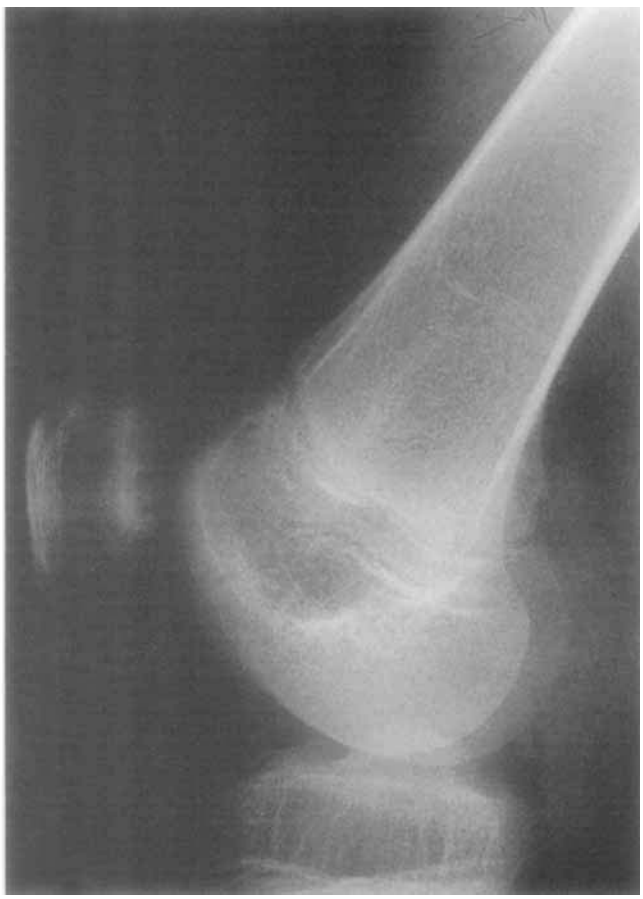

Figure 2. Radiograph of a knee, showing changes of osteochondritis dissecans of the patella.

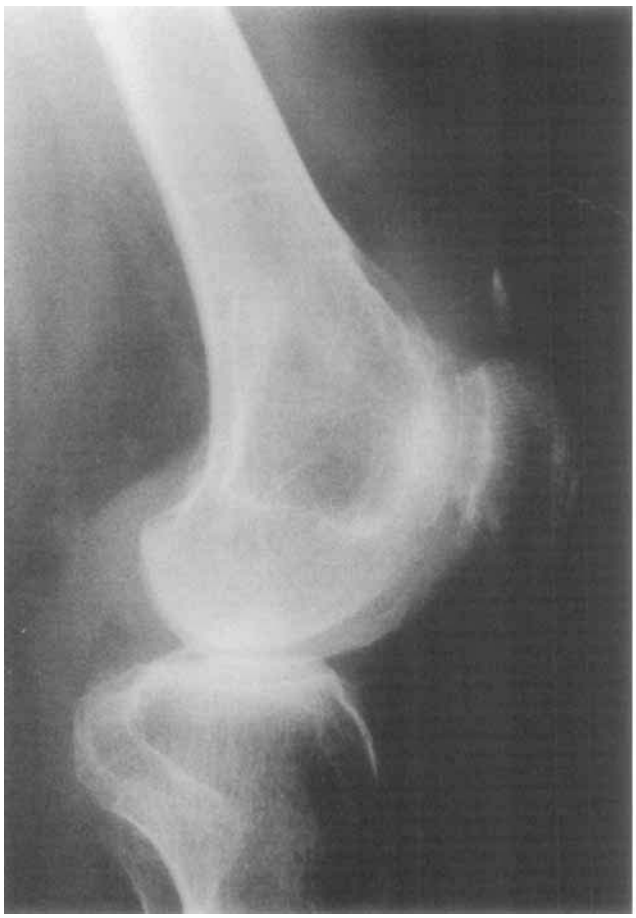

Figure 3. Radiograph of a knee, showing suprapatellar calcification.

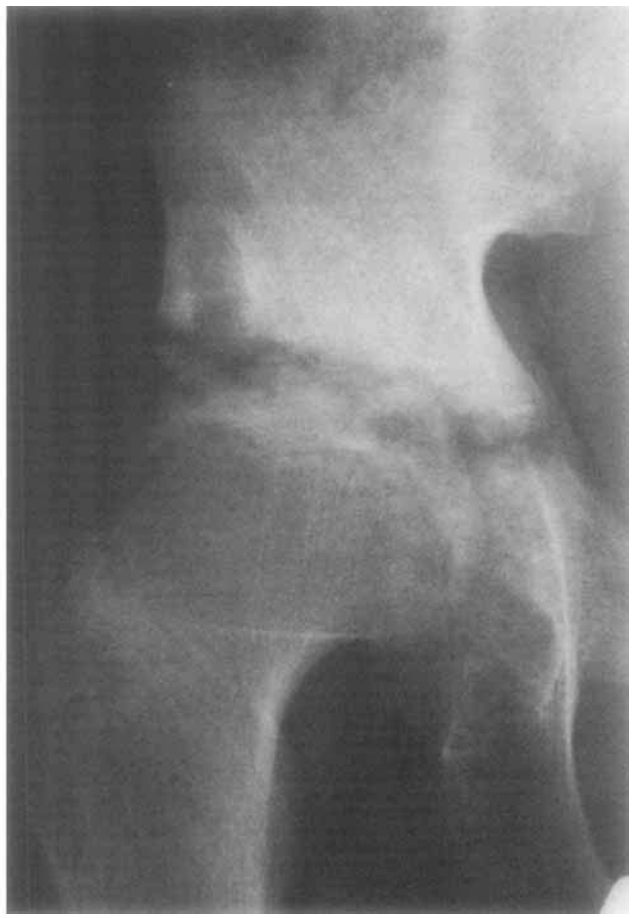

Figure 4. Radiograph of a hip, showing changes of avascular necrosis.

have had a longer duration of followup if radiographs had been available.

Radiographic changes possibly due to intraarticular TH were noted in 16 joints of 11 patients (Table 4 and Figures 1–4). It is far from certain that all these changes are complications of the intraarticular TH therapy and not simply a consequence of the chronic arthritis. The only symptomatic and serious change was a case of avascular necrosis in a hip. However, the serial radiographs of this joint showed rapid changes developing prior to joint injection.

In those joints for which serial radiographs were available from the time of injection to the followup, radiographic deterioration was unusual and mild, except for that in the hip joint. Twelve hip joints of 6 children (5 with polyarticular-onset JRA and 1 with systemic-onset JRA) were injected, and 4 joints showed 2 or more grades of deterioration (Tables 2 and 3).

Thirty-five joints (of the total 145) appeared entirely normal at followup. One child had subcutaneous calcification near the ankle joint, but the joint was otherwise normal. The remainder of the joints showed changes compatible with chronic arthritis alone.

Several joints were injected more than once (Table 5). There were no distinguishing characteristics on the radiographs of these joints that would suggest that multiple injections were deleterious. Three knees

Table 5. Joints treated with multiple intraarticular triamcinolone hexacetonide injections in children with chronic arthritis

Joint injected	Number of injections		
	2	3	4
Hip	4	1	1
Knee	26	6	3
Ankle	1	3	2
Elbow	1	1	0
Wrist	0	2	0

were injected 4 times each. One knee showed slight osteophyte formation, similar to the contralateral non-injected knee. The other 2 knees, in a patient with severe polyarticular JRA, showed osteopenia, erosions, and squared femoral condyles, findings consistent with the disease. The single pair of ankles that were injected 4 times showed only osteopenia. The single hip that was injected 4 times was in a girl with seronegative polyarticular JRA whose arthritis progressed, requiring bilateral total hip arthroplasty. Her left hip had been injected 4 times and her right hip twice. The joint disease in her hips was radiographically severe at the time of the initial injections. A biopsy performed at the time of arthroplasty showed pannus with erosions but no evidence of avascular necrosis.

DISCUSSION

Within the limitations of the information obtainable from standard radiographs, the results of our study suggest that the use of intraarticular TH in children with chronic arthritis is not associated with significant joint damage. Many of the changes we noted may merely represent a consequence of chronic arthritis in childhood, such as hypoplastic patellae (10), periarticular soft tissue calcifications, and epiphyseal collapse (11). These conditions have been described in children with chronic arthritis who apparently have not had intraarticular injections of TH.

Gilsanz and Bernstein (12) found periarticular calcifications involving 32 of 92 joints of children with juvenile rheumatoid arthritis injected with long-acting, insoluble corticosteroids. Nineteen of 40 knee joints they studied showed infrapatellar calcifications, apparently related to injection through the infrapatellar fat pad. None of our patients were injected by this route, and this difference in technique may explain some of the increased frequency of calcification seen by those authors compared with our findings.

The radiologic changes we noted in the children with serial radiographs also do not suggest that intraarticular TH has any deleterious effect on the rate of progression of the disease. Most joints showed no deterioration and, except for the hip joint, showed only mild changes that might be expected in joints affected by chronic arthritis (10,11).

The significant radiographic deterioration seen in hips injected with intraarticular TH raises the possibility that the hip joint is peculiarly sensitive to intraarticular TH. However, we have only injected patients' hip joints when severe hip pain has developed, and it is probable that the pain is a manifestation of a rapidly degenerating hip joint. Progressive hip destruction is known to occur in a significant proportion of children with chronic arthritis who have not been treated with intraarticular injection of TH (13,14).

Repeated joint injections do not seem to have deleterious effects; no increase in radiologic change was seen in joints injected on 2 or more occasions compared with joints injected on only 1 occasion. It seems very unlikely that our results were influenced favorably by the failure to obtain radiologic followup in all patients. Only 29 knee joints (20 children) were not assessed with followup radiographs. Almost all of these children had pauciarticular-onset disease, and it would seem likely that these patients had relatively mild, well-controlled disease. Nevertheless, this is a source of potential bias.

A control group of children with chronic arthritis whose joints were not injected, but whose disease and duration were similar to those in children whose joints were injected, would help confirm the results of this study. We did not have such a control group because almost all our patients were offered intraarticular TH if their arthritis was considered to be inadequately controlled with nonsteroidal antiinflammatory drugs.

Previous studies of intraarticular TH in childhood arthritis (1–3) have concentrated on the use of intraarticular TH injections in knee joints only. Our experience suggests that its use in most other joints is similarly efficacious and safe. However, its role in chronic arthritis of the hip joint remains uncertain.

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