Erbium-169 versus triamcinolone hexacetonide in the treatment of rheumatoid finger joints

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SUMMARY Erbium-169 was compared with triamcinolone hexacetonide in the topical treatment of 32 patients suffering from rheumatoid arthritis. Erbium-169 was injected into 83 and triamcinolone hexacetonide into 54 proximal interphalangeal or metacarpophalangeal joints. Both treatments produced alleviation of joint pain and swelling and improvement of grip strength. At every check-up (1-18 months) the percentage of remissions was higher after triamcinolone hexacetonide injection than after erbium-169. The difference was significant at 1, 3, and 6 months.

Intra-articular injection of the beta-emitter erbium-169 (^{169}Er) has been used with success in the treatment of rheumatoid finger joints (Menkes *et al.*, 1974). The result after 1 year was very good or good in 54% of cases. The radionuclide was injected with prednisolone acetate. In another study the effect of ^{169}Er (+ prednisolone acetate) was compared with that of saline (+ steroid). The rate of improvement after 6-12 months was significantly higher with ^{169}Er than with saline (Menkes *et al.*, 1977).

In the present study we have evaluated the effects of ^{169}Er in comparison with triamcinolone hexacetonide (TCHA). We also calculated the radiation doses in the synovium and axillary lymph nodes.

Patients and methods

^{169}Er has a half-life of 9.5 days. It radiates beta-particles with a maximum energy of 340 keV (av. 100). The effective half-value attenuation layer is 0.1 mm. The agent is administered as a colloidal citrate suspension, pH 7, mean particle diameter 10 nm (Commissariat à l'énergie atomique, Saclay).

For the proximal interphalangeal joints the dose used was 0.25 mCi and for the metacarpophalangeal joints 0.5 mCi. After treatment the joint was splinted for 3 days to reduce leakage of the radionuclide (Oka *et al.*, 1971). The leakage of the injected ^{169}Er activity was measured in the axillary lymph nodes 3-5 days after treatment. No steroid was injected with ^{169}Er . The dose of TCHA for the control joints was

5 mg. The order of injections was as follows: Patients no. 1, 3, 5, and so on ^{169}Er into right finger joints, TCHA into left finger joints. Patients no. 2, 4, 6, and so on ^{169}Er into left finger joints, TCHA into right finger joints.

The result was evaluated by observing joint pain, swelling (presence of effusion, ring size), and grip strength at 0, 1, 3, 6, 12, and 18 months. The scale of evaluation was as follows: Excellent=no effusion, no pain; good=no effusion but slight pain or no pain but slight effusion; moderate=effusion and pain diminished but not abolished; failure=no effect or worsening. An x-ray was taken of the hands before treatment and at 12 months. The erythrocyte sedimentation rate (ESR) was used to follow the general progression of the disease. The statistical treatment was made with Student's *t* test and the χ^2 test.

The series comprised 32 patients (10 males and 22 females) suffering from rheumatoid arthritis. They were all seropositive and fulfilled the criteria of the American Rheumatism Association for definite or classical rheumatoid arthritis. Their ages ranged from 36 to 74 years (average 53) and the duration of the disease from 1/2 to 23 years (average 8).

The total number of treated joints was 137. Of these, 83 (48 proximal interphalangeal + 35 metacarpophalangeal) were treated with ^{169}Er , and 54 (33 proximal interphalangeal + 21 metacarpophalangeal) with TCHA. Effusion was palpable in all the treated joints. The pretreatment data, which show that the groups were comparable, are given in the Table 1. The x-ray grading was made according to Steinbrocker.

Accepted for publication 29 March 1978

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Table 1 Pretreatment data, numbers of joints

	Erbium-169	TCHA
Pain:		
strong	4	1
moderate	65	44
slight	9	7
no	5	2
Swelling:		
strong	18	14
moderate	65	40
Ring size (average)	70 mm	68 mm
Grip strength	66 mmHg	67 mmHg
X-ray grade:		
I	33	19
II	22	16
III	28	19

Results

Topical application of ^{169}Er or TCHA to rheumatoid finger joints led to changes in all the parameters studied. The changes were more pronounced with TCHA than with ^{169}Er , especially at 1, 3, and 6 months. The effect of TCHA appeared quickly, with a climax around 3 months after the injection, followed by a gradual deterioration.

After ^{169}Er the improvement in treated joints appeared later than after TCHA. The number of excellent results (remissions) increased significantly from 1 to 12 months and that of failures decreased. At 12 and 18 months no significant difference could be found between the 2 groups in the general evaluation (pain and effusion), ring size, or grip strength. At every check-up the percentage of excellent results was higher after TCHA treatment than after ^{169}Er (Tables 2, 3, 4, Figs. 1, 2, 3.) The mean ESR did not change during the follow-up period of 12 months (41–40 mm/h).

The results did not seem to depend on the radiological grade of the treated joints. A deterioration of the x-ray grade was observed in 5 joints during the follow-up period of 12 months. Three of these joints had been treated with ^{169}Er and 2 with TCHA.

No side effects were noticed after TCHA injection. A bullous eruption developed in 2 fingers of a patient

Table 3 Changes in ring size

Month	Erbium-169		TCHA	
	Change %	Significance P	Change %	Significance P
1	-1	NS	-5	0.001
3	-2	0.01	-5	0.001
6	-4	0.001	-7	0.001
12	-5	0.001	-7	0.001
18	-4	0.01	-8	0.001

NS=Not significant.

Table 4 Changes in grip strength

Month	Erbium-169		TCHA	
	Change %	Significance P	Change %	Significance P
1	+10	NS	+26	0.01
3	+21	NS	+19	0.01
6	+10	NS	+16	NS
12	+8	NS	+16	NS

Fig. 1 Percentage of excellent results and failures.

3 weeks after injection of ^{169}Er ; the symptoms subsided in about 2 weeks. In another patient a slight erythema was observed at the site of ^{169}Er injection at check-up after 1 month.

Table 2 Results of intra-articular treatment with erbium-169 or TCHA

		1 month		3 months		6 months		12 months		18 months	
		Er	TCHA	Er	TCHA	Er	TCHA	Er	TCHA	Er	TCHA
Excellent	n	16	30	17	36	28	28	27	23	18	17
	(%)	(19)	(56)	(20)	(67)	(34)	(52)	(39)	(45)	(39)	(53)
Good	n	3	3	18	5	24	6	15	9	9	6
	(%)	(4)	(6)	(22)	(9)	(29)	(11)	(21)	(18)	(20)	(19)
Moderate	n	28	17	29	10	17	16	22	13	17	7
	(%)	(34)	(31)	(35)	(18)	(20)	(30)	(31)	(25)	(37)	(22)
Failure	n	36	4	19	3	14	4	6	6	2	2
	(%)	(43)	(7)	(23)	(6)	(17)	(7)	(9)	(12)	(4)	(6)
Total	n	83	54	83	54	83	54	70	51	46	32

Fig. 2 Changes in ring size (mm)

Fig. 3 Changes in grip strength (mmHg).

RADIATION DOSES

For a cavity area of 1 cm² (proximal interphalangeal joint) and with the injected activity of 0.25 mCi the synovial radiation dose is about 9000 rad at a depth of 0.5 mm. The corresponding value for a cavity area of 3 cm² (metacarpophalangeal joint), with the 0.5 mCi activity, is 6000 rad. The doses in axillary lymph nodes are, respectively, about 35 and 70 rad/% of escaped activity. The lymph node accumulation varied between 3 and 14 %, leading to a radiation dose of 100–1000 rad.

Discussion

Menkes *et al.* (1977) have shown that ¹⁶⁹Er injection is superior to saline in rheumatoid finger joints. In the present study both ¹⁶⁹Er and the long-acting steroid TCHA produced marked improvements in

the treated joints. However, TCHA appeared to have a more favourable effect than ¹⁶⁹Er. The difference was striking at the 1- and 3-month check-ups, and still clear 6 months after the injection. No significant difference between the groups could be seen at 12 and 18 months. The results obtained with ¹⁶⁹Er seemed to be comparable to those reported by the French workers. On the other hand, our study corroborates McCarty's (1972) findings on the efficacy of TCHA in finger joints.

Another radionuclide, yttrium-90 (⁹⁰Y), has been used with success in the treatment of rheumatoid knees (Gumpel, 1973). Both in knees (⁹⁰Y) and in finger joints (¹⁶⁹Er) the radioactivity concentration has been about 0.2–0.4 mCi/ml of cavity volume. However, the total radiation energy of ⁹⁰Y in the synovial membrane is about 6 times as high as that of ¹⁶⁹Er (Oka *et al.*, 1971). For small joints ⁹⁰Y is contraindicated because of its high penetration, which increases the hazards of radiation in peri-articular tissue.

In finger joints TCHA treatment seems to give more remissions and fewer failures than the same agent in the knee (Anttinen and Oka, 1975). This may have been due to the relatively higher dose of TCHA used in the finger joints. The weight-bearing function of the knees may also influence the result.

In our view radionuclide therapy is not indicated for finger joints. The therapy of choice is injection with a long-acting steroid such as TCHA. TCHA is simple to use, effective, and devoid of risks.

References

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