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## VALUE OF BED REST IN PATIENTS WITH RHEUMATOID ARTHRITIS\*

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**Abstract** To determine the value of bed rest in the treatment of rheumatoid arthritis, a group of patients at the time of hospitalization for therapy were randomly assigned to one of two treatment programs that differed only in the amount of bed rest prescribed. The patients were evaluated every two weeks for a total of 10 weeks by a group of rheu-

matologists from another hospital who were not aware of the patients' treatment.

Changes in individual measurements for a single patient varied widely, but most of the patients improved gradually although not markedly. There was no substantial difference between the 20 patients at rest and the 22 permitted ad lib activity.

**A**LTHOUGH the value of bed rest in the treatment of rheumatoid arthritis is a controversial subject, it has never been studied as an isolated variable in the management of that disease.

Complete or major bed rest during periods of active polyarthritis remains a major element in the treatment recommendations of many rheumatologists.<sup>1-3</sup> However, bed rest is difficult to maintain and is usually resisted by patients who consider their joint mobility already threatened. It is also costly in terms both of the nursing services required and of the time lost from the patient's usual occupation. Opposition to the use of bed rest as a therapeutic measure is based on the belief that it leads to muscle atrophy and contracture as well as joint stiffness, osteoporosis and secondary complications, such as phlebothrombosis. It is widely thought that to rest more than a patient would of his own volition carries no specific benefit.

On the other hand, the Edinburgh group<sup>2</sup> could not demonstrate any adverse effect of joint immobilization for periods up to four weeks in patients with rheumatoid arthritis. In that study, immobilization resulted in a more rapid alleviation of the local signs of arthritis than when daily periods of exercise were permitted, and it was suggested that the unlimited use of inflamed rheumatoid joints might worsen the constitutional manifestations of the disease.<sup>2</sup>

The present study was designed to evaluate the effect of bed rest on the manifestations of rheumatoid arthritis in patients admitted to the hospital for treatment of their disease. Patients were randomly assigned to a rest or activity program for a period of 10 weeks and were evaluated by physicians who did not know which treatment the patient was receiving.

## METHODS

### Patients Studied

All patients considered for admission to the study had definite or classic rheumatoid arthritis as defined by the diagnostic criteria of the American Rheumatism Association. With two exceptions, the onset of disease was in adulthood. In these cases, arthritis began before the age of 16. However, both patients had the adult form of the disease, with subcutaneous nodules and positive tests for rheumatoid factor. They were 19 and 37 years old at the time of the study. All patients had active disease as defined by the presence of soft-tissue swelling and tenderness of at least three joints and elevation of the erythrocyte sedimentation rate. Most of them also had constitutional manifestations such as weight loss, anemia and fatigability. Patients who had deformity or debility sufficient to prevent an ambulatory program or disease in weight-bearing joints that might interfere with an ambulatory program were excluded. Also excluded were patients with clinical and radiographic characteristics of ankylosing spondylitis. In all cases the disease was active and disabling enough to warrant admission to the hospital for reasons other than the present study.

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### Study Design

After admission to the Arthritis Service of the Lemuel Shattuck Hospital, each patient was evaluated by an examiner (J.A.M., M.W.R. or C.L.S.) and the study controller (R.S.P.). Two treatment programs for each patient were then designed, both being tailored to the individual patient's disease status and identical in every respect except the amount of bed rest and activity. The rest program included a minimum of 22 hours of bed rest per day during the first four weeks of the study and at least 18 hours in bed during the subsequent six weeks. The remainder of each day was devoted to sedentary activities and to the physical-therapy program. Ambulation was limited to bathroom privileges during the first four weeks and to short walks on the ward twice a day thereafter. A bathroom was available within 20 yards of the bed in all cases.

The activity program permitted ad lib activity and encouraged ambulation. Short periods of bed rest were allowed during the day for severely ill patients, and bed rest of eight hours at night was encouraged for all. Daytime passes off the ward and leaves of absence overnight were taken.

All patients participated in a physical-therapy program that was supervised by a study physical therapist. This consisted of range of motion and graded resistive exercises as tolerated, generally for 30 to 60 minutes per day. Weight-bearing exercises were given only to the patients who were permitted activity. Most patients received heat therapy by means of hot packs or a warm, moist air cabinet for a maximum of 30 minutes per day.

Drug therapy with two exceptions was restricted to salicylate, and an attempt was made to achieve a blood level of 15 to 25 mg per 100 ml two hours after the second daily dose. Two patients had been taking prednisone for several years before the study, one in the rest group, whose dose was 2.5 mg daily, and the other in the activity group, whose dose was 7.5 mg daily. These doses were not changed during the study.

### Program Selection

After the initial evaluation and preparation of the two treatment programs, one of them was chosen by reference to a table of random numbers. Patients were stratified according to three variables: sex, age (under 45 years or 45 and older) and the presence or absence of weight-bearing joint involvement sufficient to affect gait. Furthermore, the selection process was constrained so that equal numbers of patients at rest and permitted activity would be obtained in each total of 30.

During the hospital period, the patients were under the supervision of the study controller and a special study nurse (J.S.), both of whom were aware of the treatment program and responsible for its

maintenance. Deviations from the program for any reason were recorded.

### Evaluations

Patients were evaluated every two weeks during their 10-week hospital stay by a physician from the Massachusetts General Hospital who was unaware of the treatment program. Patients were instructed not to give any information about their activities or treatment in the hospital. All patients were examined in the same room under the supervision of the study nurse. The examiner asked questions related only to the presence of joint tenderness at the time of examination, and patients were instructed to answer only yes or no. No reference to the results of previous examinations was permitted.

Each evaluation consisted of the following measurements:

A joint examination, including the presence or absence of tenderness, swelling and warmth and the range of motion for all joints. The measurements were recorded qualitatively except for the range of motion, which was measured in degrees from the extended anatomic position.

Circumference of the proximal interphalangeal joints of the hands as determined by jeweler's rings.

Grip strength as measured by the average of three attempts with each hand to squeeze a folded sphygmomanometer cuff inflated to a pressure of 30 mm of mercury.

Time taken to walk a distance of 50 feet and to climb a flight of 12 steps.

Laboratory studies, including erythrocyte sedimentation rate, hematocrit and white-cell count. Rheumatoid-factor titer was measured at the time of admission by the latex-fixation method.

In addition, cinematography of the patient's gait and ability to get in and out of a chair and to perform simple tasks, such as tying shoe laces and buttoning garments, was obtained at the beginning and end of the study on 14 patients in the rest group and 17 patients in the activity group. These results were evaluated at the conclusion of the study by one examiner who was not aware of the treatment program and were graded in terms of an overall impression as much better, better, unchanged, worse or much worse.

Several calculations were used to express the results of the study. To obtain overall mean values for each study measurement for the two groups of patients, the individual values for the first two examinations (weeks zero and two) were averaged. The group mean was then compared with a mean similarly derived from the last two examinations for each patient (weeks eight and 10). These were designated respectively "before" and "after" (Table 1). Although the second examination used to determine

Table 1. Overall Changes in Study Measurements before and after Treatment.\*

GROUP	NO. OF SWOLLEN JOINTS	NO. OF TENDER JOINTS	GRIP STRENGTH (MM HG)	SEDIMENTATION RATE (MM/HR)	WALKING TIME (SEC)	RING SIZE (SUM OF 10)
Activity:						
Before	19.41 ± 1.90	38.50 ± 3.37	82.90 ± 5.53	55.05 ± 6.28	27.83 ± 4.60	96.82 ± 4.89
After	19.34 ± 2.42	33.73 ± 4.64	110.33 ± 9.57	45.82 ± 5.47	19.18 ± 3.86	93.92 ± 4.84
Difference	-0.07 ± 1.23	-4.77 ± 11.08	27.43 ± 34.40	-9.23 ± 4.61	-8.65 ± 17.02	-2.90 ± 4.17
Bed rest:						
Before	24.02 ± 2.56	32.45 ± 3.25	91.05 ± 7.18	50.00 ± 6.90	31.91 ± 6.51	99.12 ± 4.48
After	25.40 ± 2.85	27.15 ± 4.08	103.70 ± 8.52	45.05 ± 6.97	20.03 ± 3.32	97.15 ± 4.38
Difference	1.38 ± 0.93	-5.30 ± 10.50	12.65 ± 25.09	-4.95 ± 2.38	-11.88 ± 24.74	-1.97 ± 3.95

\*Mean ± SE; the "before" values are derived from the mean of the 1st 2 examinations, 2 wk apart, on each patient, & the "after" values from the mean of the last 2 examinations.

the "before" measurement was made after two weeks of treatment, the findings were not substantially different from those of the first examination. The averaging process was used to reduce the effect of minor daily fluctuations.

An attempt was also made to derive from the changes in each measurement an overall score for each patient. The large range and different direction of the changes encountered necessitated an attempt to appraise the relative value of each measurement as an indicator of disease activity or status. We chose to award each measurement equal weight and to consider the minimum level of consequence in each to be the following: walking time and grip strength; a change equal to or greater than 20 per cent of the initial value; number of tender and swollen joints equal to or greater than six joints, and at least 20 per cent; sedimentation rate equal to or greater than 10 mm, and at least 20 per cent; and ring size equal to or greater than six sizes for the 10 fingers.

To evaluate the range of joint motion, the total range about each joint was calculated. For instance, the total range in the shoulder was the sum of abduction, external and internal rotation, flexion and extension. A figure for total range was obtained for each of 10 major joints or joint groups at the beginning and end of the study. These were the shoulders, elbows, wrists, hips, knees, ankles and neck. The metacarpophalangeal joints, the proximal interphalangeal joints of the hands and the metatarsophalangeal joints were each considered collectively as one joint group for a hand or foot. Awarding for each joint group a 1+ for a 10 per cent gain in range of motion and 2+ for a 20 per cent or more gain, and the corresponding negative numbers for a loss in range, an arithmetic sum was obtained for all 20 joints or joint groups (10 on each side). Arbitrarily, a final sum of plus five or greater was considered to represent improvement and minus five or below to indicate worsening in range of motion. Intermediate values were considered "no change."

All the substantial changes in individual measurements as detailed above expressed as simple better (+), worse (-) or no change (0) were than combined

and, with equal weight given to each, expressed as a sum for each patient. A score that did not exceed ± 1 was declared "no change" or "same." The result of this analysis in terms of the number of patients considered overall as better, same or worse is given at the foot of Table 2 as a composite score.

## RESULTS

Forty-two patients were studied. Twenty-two were randomly selected to be treated without restriction of physical activity, and all completed the study. However, two of the 22 patients assigned to the bed-rest group were withdrawn from the study and are not included in the results summarized below. One, a 62-year-old woman with seropositive

Table 2. Comparison of Changes in Treatment Groups.\*

EVALUATION	ACTIVITY			REST		
	better	same	worse	better	same	worse
Swollen Joints:	<b>2</b>	<b>16</b>	<b>4</b>	<b>1</b>	<b>16</b>	<b>3</b>
average change (≥ 6/20%)	-9	-2	+9	-6	+1	+7
Tender Joints:	<b>10</b>	<b>10</b>	<b>2</b>	<b>7</b>	<b>12</b>	<b>1</b>
average change (≥ 6/20%)	-13	0	+15	-16	0	+15
Ring Size:	<b>4</b>	<b>15</b>	<b>1</b>	<b>2</b>	<b>17</b>	<b>0</b>
average change (≥ 6 sizes)	-9	-2	+7	-10	-1	0
Grip strength:	<b>12</b>	<b>8</b>	<b>1</b>	<b>8</b>	<b>11</b>	<b>1</b>
average change (≥ 20%)	+49	+2	-33	+36	+3	-55
Walking time:	<b>13</b>	<b>7</b>	<b>2</b>	<b>9</b>	<b>10</b>	<b>0</b>
average change (≥ 20%)	-17	+1	+16	-22	-1	0
Range of Motion:	<b>10</b>	<b>8</b>	<b>4</b>	<b>6</b>	<b>12</b>	<b>2</b>
average change (≥ 5)	+14	0	-10	+9	0	-5
Erythrocyte sedimentation rate:	<b>8</b>	<b>13</b>	<b>1</b>	<b>5</b>	<b>13</b>	<b>2</b>
average change (≥ 10 mm/hr)	-31	+1	+30	-19	-2	+11
Composite score†	14	7	1	10	10	0

\*For each measurement the upper line indicates the number of patients in each category (boldface type), & the lower line the average change in those patients; a change designated better or worse exceeded limits indicated in parentheses (a table showing the changes in each measurement for each patient is available on request).

†See "Methods" section.

Table 3. Initial Clinical and Laboratory Comparison of Treatment Groups.

GROUP	PATIENTS IN GROUP	AGE		SEX		DURATION OF RHEUMATOID ARTHRITIS			
		RANGE	MEAN	MALE	FEMALE	<2 YR	2-5 YR	5-10 YR	>10 YR
Bed rest	20	19-76	53.1	7	13	4	4	4	8
Activity	22	21-78	53.6	6	16	6	4	4	8

\*Titer &gt; 1:80

†Criteria of American Rheumatism Association

‡Criteria of Steinbrocker et al.<sup>4</sup>

rheumatoid arthritis of 18 years' duration, refused to follow the prescribed program and was unco-operative during the examination. In the second, a 57-year-old woman with seropositive rheumatoid arthritis of 1½ years' duration, malignant hypertension developed. When withdrawn from the study, after four and five weeks, respectively, neither had shown any change in the joint examination, using the same criteria applied to the other patients.

The two groups were very similar in most respects including the distribution of various clinical features of rheumatoid arthritis (Table 3). The higher frequency of anemia in the activity group was the greatest difference.

Mean values for the study measurements in each group before and after 10 weeks of treatment are shown in Table 1. Improvement in grip strength, sedimentation rate, walking time, ring size and number of tender joints occurred in both groups, but there was no difference in any of the findings that could be related to the treatment programs. In fact, none of the changes in the individual measurements observed during the study achieved statistical significance. In neither group did the number of swollen joints diminish.

All but one patient in each group improved in the time required to ascend and descend a flight of stairs, the average improvement in the rest group being 5.2 seconds and that in the activity group 7.5 seconds. Six patients in the rest group were unable to negotiate stairs at any time as opposed to only two in the activity group.

No particular *chronologic* pattern of change in the various indexes was apparent. Some patients demonstrated improvement during the first few weeks, but others changed only as the end of the 10-week study period approached. In the majority, improvement was gradual and punctuated by occasional exacerbations.

The changes in the individual measurements for a single patient varied widely. Often, improvement or worsening in one was not associated with a similar change in the others. Indeed, in 17 patients, at least one measurement contravened the general trend. The changes during the study for the individual measurements are shown in Table 2. In terms of the composite score, the activity group contained 14 patients who were better, seven who were un-

changed and one who was worse, whereas in the rest group, 10 were better, and 10 unchanged. In several of the measurements, greater variability was characteristic of the activity group. For instance, range of motion was more likely to change for the better or, to a lesser extent, for the worse than to remain unchanged (Fig. 1). On balance, any difference between the two groups, based on this approach to the data, appeared to favor activity as the more effective of the two treatments; however, as previously noted, the changes in both groups were minor.

Cinematography before and after the 10-week study period was available on 31 patients, 14 in the rest group and 17 in the activity group. Most patients in the activity group (10 of 17) were rated improved as opposed to less than one third of the rest group (three of 14). An attempt to compare the evaluations made by cinematography and the composite index is presented in Table 4. The scores for the rest patients are given in the

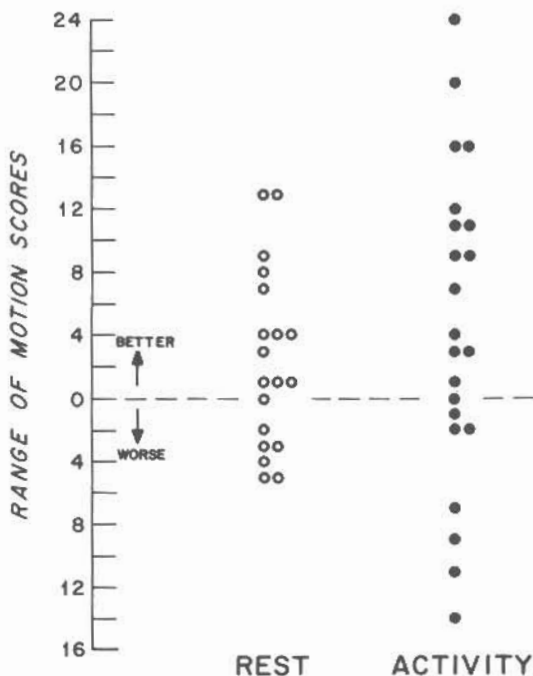


Figure 1. Changes in Range-of-Motion Scores during the Study.

Table 3 (Concluded).

GROUP	LATEX FIXATION TEST*		HEMATOCRIT		SEDIMENTATION RATE		FUNCTIONAL CLASS†		RADIOLOGIC STAGE‡			
	POSITIVE	NEGATIVE	≥ 36%	< 36%	≤ 20 MM/HR	> 20 MM/HR	II	III	I	II	III	IV
Bed rest	18	2	14	6	5	15	4	16	3	6	5	6
Activity	18	4	10	12	2	20	3	19	4	6	5	7

\*Titer &gt; 1:80

†Criteria of American Rheumatism Association

‡Criteria of Steinbrocker et al.<sup>4</sup>

upper half of each box, and those for the activity patients in the lower half. There were six cases in which the two differed by more than one grade. Two of these were patients permitted activity whose function as determined by cinematography improved despite a lack of change by the other criteria. Three were patients at rest whose cinematographic evaluation deteriorated whereas the other criteria showed minor improvement. Two additional measurements, the time required to climb and descend a flight of stairs and the ability to get out of a standard chair, showed the same minor degree of improvement in both treatment groups.

Table 4. Correlation of Composite Score and Movie Evaluation.\*

MOVIE	SCORE				MOVIE TOTAL
	MUCH BETTER	BETTER	SAME	WORSE	
Much better	1/4	0/1	0/2		1/7
Better	1/2	0/1	1/0		2/3
Same	0/1	3/1	5/2	0/1	8/5
Worse		3/0	0/2		3/2
Score total	2/7	6/3	6/6	0/1	14/17

\*Rest/activity.

The mean salicylate level during the study was somewhat higher in the activity group (19.1 mg per 100 ml) than in the bed-rest group (16.4 mg per 100 ml), but the difference was statistically insignificant. Salicylate levels did not correlate with results in individual patients. Adherence to the prescribed program was good in 30 patients, fair in eight and poor in four, with equal distribution between the two treatment groups. There was no correlation between adherence to either program and end results. Correlations were also sought between each patient's final score and such variables as sex, age, rheumatoid-factor positivity, hematocrit and the study examiner. None were remarkable. Two variables, the duration of disease and the x-ray stage at entry, did correlate with improvement to the extent shown in Table 5. Fifty per cent of patients whose disease was of less than two years' duration and in x-ray stages 0 or I (no erosive changes) showed marked improvement as opposed to less than 15 per cent of those with more prolonged or radiologically severe disease at the time of admission.

## DISCUSSION

The randomization procedure employed in assigning patients to the rest or activity program resulted in a very close similarity between the two groups in most of the clinical indexes. As expected, there were two to three times as many women as men in each group. The study design was completely successful in preventing the examiners from knowing which treatment program a patient was on. In one case an examiner saw a patient preparing to leave for a weekend pass toward the end of his study period, but there was no apparent change in the subsequent evaluation.

To ensure that factors such as adherence to bed rest and medication schedule, emotional stress and physical therapy would have a uniform influence, only hospitalized patients were studied. This requirement undoubtedly limited the amount of physical activity in the "activity" group to less than would have been permitted on an ad-lib program in an unrestricted environment. We also desired to provide for patients in very different stages of their disease treatment programs that would be considered reasonable for each whether activity were encouraged or restricted. This decision may also have limited the difference in physical activity between the two treatment groups. Conversely, however, neither program could be criticized as having been artificially exaggerated for the purpose of the study, with results for that reason irrelevant to practical management.

Although it may not have been possible to keep the patients in the activity group as active as they might have been at home, their program was clearly different from that of the rest group in the time spent at bed rest. Most physicians who advocate

Table 5. Variables Correlating with Outcome.

DEGREE OF IMPROVEMENT	SCORE*	RADIOLOGIC STAGE		DURATION OF DISEASE	
		0-I	II-IV	0-2 Yr	> 2 Yr
None	< +2	3	15	3	15
Some	+2, +3	0	15	2	13
Marked	> +3	4	5	5	4
Total patients		7	35	10	32

\*Composite patient score as per text.

rest in the treatment of rheumatoid arthritis emphasize the importance of bed rest and make little distinction between different kinds of activity as far as their effects on the disease are concerned. If this is so, the study protocol should have provided a good test of the therapeutic effect of bed rest.

The overall result of the study gives no evidence of the superiority of either treatment program. The striking finding is that although a half or more of the patients in both groups improved, the degree of improvement was not marked in most cases, the majority of the measurements recorded in Table 1 showing what was determined to be an inconsequential change. More patients in the activity than in the rest group showed improvement in grip strength, walking time and joint range of motion. However, a tendency among the few who were worse to deteriorate more on the activity program balanced the total net change in the two groups. The tendency for the activity group to show more change in both directions during the study period is indicated by the range-of-motion scores in Figure 1. Whether or not this variation can be attributed to the greater amount of physical activity is problematical.

The finding that most patients improved to some degree during their hospital course may be due to the fact that all received daily physical and regular salicylate therapy. Isolation from some of the usual physical and emotional stresses of living may also have been involved. Since all patients were undoubtedly less active physically than they might have been if not hospitalized, the possibility that some benefit to both groups was obtained from rest cannot be denied. On the other hand, it must be

concluded that, quantitatively, the value of rest could not be demonstrated. It is also possible that the relatively minor changes noted reflected the natural tendency of the disease to improve after periods of exacerbation.

There are no published studies of the effect of bed rest in rheumatoid arthritis. Partridge and Duthie<sup>5</sup> investigated the effect on patients with rheumatoid arthritis of complete immobilization for four weeks in plaster casts. In comparison with a control group treated with bed rest and simple splinting over a subsequent 12-week period, no adverse effect was found, nor were any serious complications encountered. It was stated that sedimentation rates tended to diminish more in the splinted group and that relief of pain occurred sooner. Since both groups were at virtually total rest, that study is not comparable with ours.

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