Use of Resting Splints by Patients with Rheumatoid Arthritis

(Compliance, synovitis, pain)

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A follow-up evaluation of 50 patients with rheumatoid arthritis who were fitted with full bilateral wrist and hand resting splints revealed that 62 percent wore them most or all of the prescribed time. Patients deviated from the prescribed splint program when their symptoms remitted or diminished, and adhered more closely to the program when they experienced persistent inflammation. Patients splinted during a hospital stay were somewhat more compliant than those splinted as outpatients. Patients judged to be noncompliant discontinued splint usage because of a decrease in joint pain or stiffness, or both. Their decision did not appear detrimental, since, during the course of the study, there was no significant difference between compliant and noncompliant patients in range of motion of hand or wrist joints at follow-up evaluation and, when range of motion at the time of initial evaluation was compared with that at the follow-up examination, a higher proportion of noncompliant (37%) than compliant patients (16%) showed improvement.

Resting splints (Figure 1) are commonly prescribed for nocturnal use by patients with rheumatoid arthritis who have inflammation of the wrists or finger joints, or both. It has been shown in a controlled study that splinting has a salutary effect on inflammation in the diseased joints, presumably because of the imposed restriction in joint motion (1). Whether full resting splints for the wrists and fingers prevent deformity is not known.

Compliance and the factors influencing compliance have been of interest to many. Davis (2), in an extensive review of the literature, found that, regardless of the medical regimen prescribed, at least one-third of patients in most studies failed to comply with their physician’s orders. Oakes and others (3), in a study of splint usage by patients with rheumatoid arthritis who were fitted with a single static resting splint for the hand and wrist, found that females used their splints more than the males, older individuals more than the younger, and patients in a lower social class more than those of middle or upper social class. Moreover, regardless of sex, age, or social class, patient compliance was greatest where family expectations for compliance were high.

Since further information concerning factors that influence splint wear by arthritic patients might be helpful in the selection of patients...
for splinting, a follow-up study was made of patients fitted with full bilateral static wrist and hand resting splints within a three-year period in the Indiana University School of Medicine's occupational therapy department.

Methods

Patients. Fifty patients who met diagnostic criteria of classical or rheumatoid arthritis (4), and who had been splinted as noted above, were identified for follow-up through a review of medical records. The patients ranged in age from 18 to 83 years (mean, 53 years); 41 patients (84%) were female. Thirty patients had been splinted while they were inpatients and 20 while they were outpatients.

At Time of Splinting. Modifications in the basic splint design were made as needed to promote patient comfort while maintaining a functional position of the hand. Each patient learned how to put on and remove the splint, and practiced the process under therapist supervision. Also, each patient was taught when to use the splints, was given the reasons for splinting, was cautioned about complications (e.g., skin breakdown), and was instructed to contact the occupational therapy department or rheumatologist if the splints were uncomfortable or did not fit satisfactorily.

As part of the routine evaluation by the occupational therapist at this time, the amount of pain, the range of motion in the hands and wrists, and the duration of morning stiffness were recorded by the therapist. Severity of pain was graded as: mild (occurring only with stressful activity); moderate (occurring with active motion); or severe (occurring even at rest). Range of motion was graded as: no loss (95% or more of total possible range); mild loss (75 to 95% of total possible range); or marked loss (less than 75% of total possible range).

Follow-up. Each patient underwent a follow-up evaluation during a visit to the rheumatology clinic. The interval between splint fabrication and the follow-up evaluation varied between 3 and 34 months for the group, the mean interval being 17 months. Questions asked each patient included his or her frequency of splint wear and whether the splint was discontinued, the length of the time the splint had been worn after fitting and the reason(s) for cessation of splint use. The degree of pain in hands or wrists, or both; duration of morning stiffness; and range of joint motion were recorded and the results were compared to those documented when the splints were fabricated. For purposes of the study patients were considered "compliant" if they wore their splints more than 50 percent of the prescribed time, and "noncompliant" if they wore them 50 percent of the prescribed time or less.

Analysis. Differences in the evaluations between the two groups were compared by chi-square analysis.

During the period of splinting
each patient was taking salicylates or another nonsteroidal, anti-inflammatory drug (NSAID). From the annotations made in the medical record by the rheumatologist or the rheumatology nurse, a judgment was made concerning the compliance of each patient with the prescribed medication regimen during the course of the study. Patients were judged "compliant" if they took 75 percent or more of their prescribed salicylate or NSAID doses, and "noncompliant" if they took less than 75 percent of their prescribed doses.

**Results**

Thirty-one (28 females, 3 males) of the 50 patients, or 62 percent, were judged to be compliant with the prescribed program of splint usage. Although the differences were not striking, compliance tended to be greatest in patients over the age of 40 and under the age of 70 (Figure 2). Twenty-four of 33 patients (73%) who were 40 to 69 years old were considered to be compliant, whereas this was true of only 4 of the 9 patients (44%) who were less than 40 years old and 3 of the 8 (37%) who were 70 or older.

The interval between the onset of rheumatoid arthritis and fabrication of the splints was highly variable and ranged from less than 1 year to more than 34 years. Twenty patients (40%) had the disease 2 years or less at the time of splinting, whereas 14 individuals (28%) had the disease 9 years or longer (Figure 3). Compliance tended to be greater in those whose arthritis had been present for a relatively brief duration (2 years or less), and in those whose disease had been present for the longest periods (9 years or more). Thus, 60 and 70 percent, respectively, of the patients in these groups were judged to be compliant. On the other hand, only 6 of the 16 patients (37%) in whom the interval between the onset of arthritis and fabrication of splints was intermediate in length (3 to 9 years) were compliant with the splinting program.

A slightly greater tendency toward compliance with the splinting program was noted among individuals splinted as inpatients than among those splinted as outpatients. Sixty-seven percent (20 of 30 patients) of those splinted as inpatients wore their splints regularly at the time of followup, whereas 55 percent (11 of 20 patients) of those splinted as outpatients were judged to have been compliant.

Analysis of the severity of the patient's pain indicated that at follow-up evaluation paid had diminished in the group as a whole. Eleven of the 19 noncompliant patients (58%) reported improvement.
in pain after splinting, and only 4 of the 19 (21%) reported moderate or severe pain at the follow-up evaluation (Figure 4). In marked contrast, only 8 of the 31 compliant patients (25%) reported improvement in pain, whereas 13 patients in this group (42%) reported moderate or severe pain at followup.

Comparison of ranges of joint motion indicated no marked change in the interval between splinting and follow-up evaluation. Only 10 percent of the patients in each group demonstrated a decrease in range of motion at the followup (Figure 5); all other patients remained unchanged or demonstrated improved wrist and hand motion.

The duration of morning stiffness diminished in the group as a whole during the course of the study, and the changes that occurred were similar in compliant and noncompliant groups (Figure 6). Only 16 percent of patients in each group noted an increase in the duration of morning stiffness during the period following splinting. By chi-square analysis, none of the above differences between the compliant and noncompliant groups relevant to duration of morning stiffness, range of motion, or severity of joint pain at the time of follow-up evaluation was statistically significant ($p > 0.05$).

At the time of the follow-up evaluation, 12 of the 19 noncompliant patients reported that they wore their splints occasionally, whereas 7 had abandoned the use of their splints. The interval between fabrication of the splints and cessation of splint use, or deviation from the prescribed program of splint use, ranged from less than 1 week to more than 1 year (mean, 26 weeks). Nine patients said that they had stopped wearing their splints because of discomfort or pain or be-

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**Figure 4**
Changes in severity of pain in compliant and noncompliant patients with rheumatoid arthritis fitted with resting splints. Severity of pain at time of splinting is graded along the vertical axis, and at follow-up evaluation, along the horizontal axis. Numerals within small squares and within parentheses denote numbers of patients. Mod = moderate (see text for details).

**Figure 5**
Changes in range of joint motion in compliant and noncompliant patients with rheumatoid arthritis fitted with resting splints. Range at time of splinting is shown along the vertical axis, and at follow-up evaluation, along the horizontal axis. Numerals within small squares and within parentheses denote numbers of patients (see text for details).
Because they felt the splints were cumbersome. Five of these patients had brought their splints to the occupational therapist for adjustment, but each had continued to experience discomfort after the adjustments. Two patients discontinued the splint program because they believed their splints caused increased stiffness. Two patients terminated their splint program because of a lack of apparent improvement. One 76-year-old patient discontinued her splints because she considered them awkward in the presence of frequent nocturia. Five patients believed their pain had decreased sufficiently so that they no longer needed the splints.

A direct relationship was observed between compliance with the splint program and compliance with the prescribed medication (aspirin or NSAID) regimen. Thus, 26 of the 31 patients (84%) who were compliant with their splint program, but only 10 of the 19 (53%) who were not, were judged compliant with their medication program ($p = <0.02$).

**Discussion**

About two-thirds of the 50 patients in this study wore their splints most, or all, of the prescribed time. This proportion is similar to that reported in an analysis of compliance with various other medical treatment programs for other diseases (2).

One finding was that patients fitted with splints while hospitalized were slightly more compliant than those who were fitted as outpatients. The hospitalized patients may have seen more benefit initially in the use of their splints. In addition, splint use by the inpatients was closely monitored during hospitalization (mean, 19 days), and the inpatients received positive reinforcement from hospital personnel regarding the splint program, which was not available to those patients splinted in the outpatient clinic.

Compliance seemed greatest among women between the ages of 40 and 69, but most of the study population were females in that age range. Although the duration between the onset of arthritis and fabrication of the splints averaged 7 years for the population as a whole, compliance was greatest among those patients who had arthritis for two years or less. Perhaps these individuals were more receptive to suggestions concerning therapy than those who had an active disease for longer periods and who may have experienced more treatment failures.

Although compliant and non-compliant patients appeared to be similar with respect to the duration of morning stiffness at the time of splinting, and with respect to the reduction in stiffness later or during the period of the study, the reduction in joint pain following splinting tended to correlate inversely with compliance. Thus, a higher proportion of compliant (42%) than those of noncompliant (21%) individuals continued to experience moderate to severe pain at the time of follow-up evaluation. It appears that patients who wore splints less than 50 percent of the time were less symptomatic than those who used splints more regularly. The reasons for this difference are not clear, but perhaps those who were least compliant with splint usage may have been more compliant in other areas of their total treatment program, or perhaps their disease remitted earlier.

In most patients, range of motion did not change between the time of splinting and the follow-up evaluation, and the few changes noted were not statistically significant.
The noncompliant patients tended to be those who had milder disease in their wrists or hands, or both (i.e., less pain and stiffness). Their decision to discontinue the splints, in retrospect, did not appear to have been detrimental since most of them did not exhibit increased stiffness or pain, or decreased range of motion after discontinuance of use. Many reported intermittent use of splints at times of increased discomfort. Thus, it appeared they managed their own splint program effectively and did not require the use of night resting splints at the time of the follow-up evaluation as they had originally been prescribed by the rheumatologist.

No factors apparent from this study would enable the rheumatologist or the occupational therapist to predict which patients were likely to use or require hand splints over a lengthy period. This study indicated, however, that most patients fitted with hand splints wear them either regularly or periodically to alleviate pain in the wrists and hands. Also, it appeared that stiffness and range of motion were not affected by the use, or lack of use, of hand splints during the period of the study.

At this rheumatology center, almost all patients with rheumatoid arthritis who have wrist or hand involvement, or both, are referred to occupational therapy for fabrication of resting splints. Patients routinely are requested to wear the splints nightly for an indefinite duration. The results of the present study indicate that, although most patients found the splints beneficial, and frequently experienced prompt symptomatic relief with initial splint usage, continued, long-term splint use varied with changes in the patient's disease activity and/or symptoms.

Ideally, the decision to alter any part of the treatment program (including the use of hand splints) should be made jointly by the physician and the patient. Patients with active hand or wrist arthritis or both should be questioned regularly by the rheumatologist about comfort and use of their splints. The results of this study suggest that patients whose hand or wrist arthritis had remitted or improved markedly may not have made inquiries about splints that had been prescribed for an extended period of more active disease, and the original splint prescription thus may not have been modified by the physician. Since the patients seemed to regulate the use of their splints appropriately without consultation with the physician and without detriment, physicians may need to emphasize to the patients the use of splints during periods of exacerbation and may rely on the patient to adapt the wearing schedule during periods of decreased symptoms.

As a result of our findings, we will continue to fit most patients who have active rheumatoid arthritis of wrist or hands, or both, with night resting splints. The fact that most patients wore bilateral splints without difficulty suggests that minor design modifications at the time of fabrication to facilitate comfort and ease of application may promote splint usage. Although splint wear may not eliminate pain over a lengthy period, it does appear to reduce pain during exacerbation of symptoms. It may be helpful to communicate this information to patients at the time of splinting to help them understand the purpose of splinting.

Summary
A study of 50 patients with rheumatoid arthritis indicated that about two-thirds were compliant with the prescribed usage of wrist and hand night resting splints that had been fabricated for hand or wrist synovitis, or both. Noncompliant patients tended to have less pain and stiffness than compliant individuals at follow-up evaluation and exhibited no deterioration in range of motion. The results suggest that patients discontinued splint usage because of improvement in joint pain and stiffness and that their decisions to discontinue splinting did not appear to be detrimental to their joint motion.

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REFERENCES