



# Effectiveness of Rigid Wrist Splints on Reducing Pain and Improving Hand Function in Patients with Inflammatory Arthritis



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## Abstract

**Objectives:** To examine the evidence of the effectiveness of rigid wrist splints on reducing pain and improving hand function in patients with inflammatory arthritis.

**Results:** Our review revealed four studies suggesting that rigid wrist splints may reduce pain and improve hand function for patients with inflammatory arthritis.

**Conclusion:** Rigid wrist splints are effective and may result in pain reduction and improvement in hand function for patients with inflammatory arthritis.

**Keywords:** Rigid wrist splint; Pain; Hand function; Inflammatory arthritis; Occupational therapy

## Introduction

Inflammatory arthritis affects joints and causes pain, stiffness, and deformities Fries [1] & Imboden [2]. Essential components of treatment are the prevention of hand deformities and the preservation and restoration of hand function Richardson [3] & Tassiulas [4]. Splinting reduces pain and inflammation and improves hand function. Wrist splints support the wrist joint and allows grasping and manipulating objects U.S. Department of Health and Human Services [5] & Wolff [6]. The purpose of this study was to examine the evidence of the effectiveness of rigid wrist splints on reducing pain and/or improving hand function in patients with inflammatory arthritis. For the purpose of this study, we created a clinical/research PICO question (Population, Intervention, Comparison, and Outcome), a key to evidence-based decision Richardson [3].

The PICO formed for our study is as follows:

(P): For patients with inflammatory arthritis

(I): Do rigid wrist splints

(C): No comparison

(O): Reduce pain and/or improve hand function?

## Methods

### Review of literature and search strategy

A research has been made in the following databases: Ovid, CINAHL, and PubMed. Keywords and Search items used to search articles for our study were rigid wrist splint, pain, hand function,

inflammatory arthritis, and occupational therapy (OT). By combining the search results, we found articles on the effectiveness of rigid wrist splints on reducing pain and/or improving hand function in patients with inflammatory arthritis. Based on the format of PICO question, four most relevant articles were selected for our study. Studies cited in the reference of the four articles along with other articles were also used to collect important information. After all, the strongest evidence-based article was chosen based on level of evidence and significance level to highlight and confirm our results and conclusions.

## Results

The four selected articles were related to the effectiveness of rigid wrist splints on reducing pain and/or improving hand function in patients with inflammatory arthritis. All articles were related to our PICO question. A summary of the four articles in relation to our PICO is as follows. Articles are presented and listed based on study power and sample size.

### Haskett [7]

Based on the hierarchy of levels of evidence in evidence-based practice, this study was a level III evidence crossover design Hughes [8]. Number of subjects was 45 subjects with inflammatory arthritis. Three rigid wrist splints were used and fabricated 15-20° wrist extension and 5° ulnar deviation or adjusted to 20° wrist extension. Subjects wore each splint for 4 weeks with 1-week washout period in between. Subjects were asked to wear them at least 10

hours a week. Subjects perceived pain by 10cm horizontal visual analogue scale (pain VAS). The rigid splints significantly reduced pain ( $p=0.007$ ). Hand function on the Arthritis Hand Function Test (AHFT) significantly improved ( $p<0.02$ ).

### Stern [9]

Based on the hierarchy of levels of evidence in evidence-based practice, this study was a level III evidence crossover design Hughes [8]. Number of subjects was 42 Subjects with Rheumatoid Arthritis (RA). Three commercial rigid wrist orthoses were used and positioned with  $10^\circ$  wrist extension. Subjects wore each orthosis for 1 week with 1-week washout period. Subjects were directed to wear the orthoses at least 4 hours a day, 5 days a week. Finger dexterity improved significantly with faster performance in the Purdue Pegboard test. Hand function improved significantly with faster performance in the Jebsen-Taylor test. Learning effect was found in many subtests.

### Stern [10]

Based on the hierarchy of levels of evidence in evidence-based practice, this study was a level III evidence crossover design Hughes [8]. Number of subjects was 36 subjects with RA. Three commercial rigid wrist orthoses were used with wrist extension of  $10^\circ$ . Subjects wore each orthosis for a week with 1-week washout period. Subjects were asked to wear the splints at least 4 hours a day and 5 days a week. Splinted grip strength had a significant improvement of 0.7kg. in terms of daily tasks, the orthoses interfered with hand function.

### Tijhuis [11]

Based on the hierarchy of levels of evidence in evidence-based practice, this study was a level III evidence crossover design Hughes [8]. Number of subjects was 10 subjects with RA. Two rigid wrist orthoses were used and adjusted to have  $15^\circ$  wrist extension. Subjects wore each orthosis for 2 weeks and had a 1-week washout period. Subjects were asked to wear the orthoses as much as possible during day and night. In terms of the pain VAS and grip strength, there were no significant differences between the start and the end of treatments. In terms of hand function, only 2 of 10 subjects for each orthosis reported improvement.

### Discussion

Haskett et al. [7] which examined the effectiveness of rigid wrist splints on reducing pain and/or improving hand function in patients with inflammatory arthritis was selected as the strongest evidence based article. Based on the hierarchy of levels of evidence in evidence-based practice, this study was a level III (Evidence obtained from well-designed non-randomized controlled trials, single group pre-post) Hughes [8]. Among other reviewed studies, they used the largest sample size of 45 subjects. In this study, the rigid splints significantly reduced pain ( $p=0.007$ ) and improved hand function ( $p<0.02$ ). The effectiveness of rigid wrist splints in reducing pain and improving hand function for individuals with inflammatory arthritis was supported in our evidence-based review study. Thus, the following treatment plan has been developed in our study and can be applied in clinics to ensure implementation of recommendations on rigid wrist splints (Table 1).

**Table 1:** A summary of recommendations, plan and audit tool.

Recommendation	Implementation Plan	Criteria	Audit Method	Compliance Plan
1. An interested qualified therapist will attend a training course in splinting.	The Department of OT will enroll the therapist in a training course in splinting.	The therapist who attended the training course will obtain a certificate as proof of competency in splinting.	The OT manager will check the certificate and keep the certificate in the ring binder. Every 2 months, the OT manager will also confirm the presence of a certified therapist.	If the therapist fail to obtain the certification or the certified therapist is transferred to another institute, a new therapist will attend a training course in splinting to obtain a certificate.
2. Non-certified therapists will show competency in splinting.	The certified occupational therapist will prepare a written test and a practical test. The noncertified therapists will take the tests within 2 weeks.	Those therapists achieving 80% on the written test and earning approval by the certified therapist on the practical test will be considered competent in splinting.	The OT manager will update names of therapists who passed the tests on the competent therapist list.	Therapists who could not meet the criteria for passing will take the test after 1 month with or without reeducation. The therapists can be reeducated if they want.

3. Therapists will provide a rigid wrist splint to the patients.	Therapists will provide a rigid wrist splint to the patients. A custom splint will be fabricated in 15-20° wrist extension and 5° ulnar deviation. A prefabricated splint will be adjusted to 20° wrist extension. The therapists will give each patient a handout on the use and care of the splint. The therapists will also direct the patients to use the splint during activities that cause pain or discomfort during the day. Lastly, the therapists will encourage the patients to wear the splint at least 10 hours a week and to keep a splint diary	Therapists will ensure the correct degrees of a rigid wrist splint. Also, therapists will provide all standard information, including a handout and directions.	Once a month, the OT manager will check the degrees of the rigid wrist splints given to patients. Also, the manager will ask patients if they received all information and materials.	The OT manager will require the therapists who failed to fabricate or adjust the correct degrees of a rigid wrist splint to take the written and practical tests again. If needed, the OT manager will mandate that those therapists receive more education. The OT manager will educate those therapists who did not provide appropriate information or materials on the importance of following the standard intervention plan.
4. Using the AHFT and the pain VAS, the therapists will evaluate the patients after the splint intervention.	The patients who wore the rigid wrist splint for 4 weeks will be evaluated with the AHFT and the pain VAS by occupational therapists who showed competency in splinting, performing the AHFT, and using the pain VAS.	All of the patients who wore the rigid wrist splint for 4 weeks will be evaluated in a correct manner.	Once a month, the OT manager will check if all patients who had worn the rigid wrist splint for 4 weeks were evaluated in a correct manner. The results of the evaluations will be recorded in the ring binder for a reference.	OT manager will educate those therapists who did not evaluate patients after giving them a splint or evaluated them in an incorrect manner on the importance of the evaluations. If needed, the OT manager can require the therapists to undergo the education process again.

## Conclusion

Our review suggested that rigid wrist splints are effective and may result in pain reduction and improvement in hand function for patients with inflammatory arthritis. Thus, clinical guidelines, recommendations, a plan and audit tool have been created in our study to implement rigid wrist splints in clinics. The clinical guidelines for recommended intervention, the plan, and the audit tool recommend therapists to apply rigid wrist splints with patients with inflammatory arthritis.

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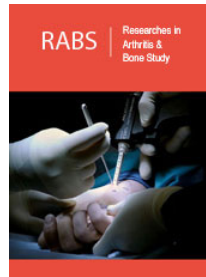
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