

Acceptance, Satisfaction and Immediate Impact of Customized Ulnar Deviation Control Splint for Patients with Rheumatoid Arthritis

Payal¹, Shivangi Mehra², Sakshi Saharawat², Dr. Chitra Kataria³

¹Student, BPO, ISIC Institute of Rehabilitation sciences, New Delhi, India

²Assistant Professor, MPO, ISIC Institute of Rehabilitation Sciences, New Delhi, India

³Principal and Head of Rehab Extension, Indian Spinal Injuries Centre- Institute of Rehabilitation Sciences, New Delhi, India

Corresponding Author: Payal

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ABSTRACT

Background: Rheumatoid arthritis is a chronic, progressive systemic disease that affects many joints and produces pain and inflammation. RA usually affects the wrist, metacarpophalangeal joints, and proximal interphalangeal joints in the hand. Ulnar deviation is one of the most often occurring deformities in RA. It can also cause muscular weakness, pain, stiffness, reduced joint motion and damage associated tissues, such as tendons and their sheaths. Various static and dynamic splints are used to correct the ulnar deviation in RA. By exerting an external strain on the locomotor system, a splint's main goal is to maximize joint mobility. While splints used at rest are thought to reduce inflammation and avoid contractures, splints worn while movement are meant to support joints, relieve discomfort, and enhance function. Many static splints for ulnar deviation limit patients' everyday activities, offer no further benefits in terms of hand function improvement, and lower their quality of life in the early stages of rheumatoid arthritis. The literature provides scant information regarding the use of dynamic splints for ulnar deviation in RA patients, taking into account each finger separately and evaluating the patients' acceptance and satisfaction with them. The goal of this research is to create a customized ulnar deviation control splint that reduces ulnar deviation angle precisely while allowing phalanges to move freely. It is anticipated that this splint will enable the person to carry out daily tasks without experiencing any major constraints.

Objective: This study finds the immediate effect of the customized ulnar deviation splint and the level of acceptance and satisfaction among ulnar deviation in patients with rheumatoid arthritis.

Study design: A pre-test post-test study design

Significance: In many studies, it has been mentioned that the design of some splints affects the range of motion of patients, which prevents them from performing daily activities. Therefore, this splint has been carefully designed not to restrict patients' daily activities. In this splint, the fingers will remain free, allowing patients to perform small tasks such as carrying a bucket, suitcase, bag, etc.

Method: Total number of 5 subjects were taken with rheumatoid arthritis having ulnar deviation with age group from 50-70 years and pre-test reading of ulnar deviation angle was

done. Subjects were then fitted with customized ulnar deviation control splint thereafter post-test readings of immediate effect on ulnar deviation angle were recorded.

Result: The result shows significant improvement in ulnar deviation angle. The result also showed on Likert scale that 4 out of 5 patients were satisfied with customized ulnar deviation control splint and the patients agreed with the comfortability of splint. Thus, it indicates that the subjects showed improved ulnar deviation angle and most of the patients were satisfied in terms of comfortability, acceptance and performance of the given orthotic intervention.

Conclusion: The customized ulnar deviation control splint was effective in improving the ulnar deviation angle after the given orthotic intervention in the subjects with ulnar deviated hand due to rheumatoid arthritis.

Keywords: Rheumatoid arthritis, ulnar deviation, ulnar deviation control splint, Likert scale, goniometer, ulnar deviation angle.

INTRODUCTION

Rheumatoid arthritis is a progressive, chronic systemic sickness that affects multiple joints, causing inflammation and pain. It also affects related tissues, including tendons and their sheaths, and can lead to muscular weakening.¹ The main symptoms of RA - pain, stiffness, weariness, and physical limitations and synovitis and joint erosions brought on by RA result in capsular distention, ligament laxity, decreased joint mobility, and muscular imbalance have a bigger influence on a person's capacity to participate in fulfilling activities for their family, career, and leisure.² RA causes mainly 3 hand deformities which includes ulnar drift, swan neck, and boutonniere due to external stresses on joints. RA can also result in limitations on social involvement, structural impairment, and functional disability.³

RA typically affects the wrist, metacarpophalangeal joints, and proximal interphalangeal joints in the hand among other joints in the upper extremities. People tend to underreport hand abnormalities, even though 90% of RA patients develop hand deformities during the course of their disease.³

With a peak occurrence in the fourth decade of life, the prevalence of RA in adults has been reported to range from 0.15 to 1.37% in men and from 0.5 to 3.8% in women.⁴ An estimated 45% of rheumatoid arthritis patients will have ulnar deviation deformity

if their condition has continued for more than five years.⁵

Splinting is considered to be a crucial aspect of the treatment and long-term management of rheumatoid arthritis patients, particularly being helpful in moderate to severe cases. The primary purposes and indications of hand splinting includes: resting a joint, immobilizing a joint for an extended length of time, correcting or preventing deformity, and providing support and stabilization of some joints to permit movement in others.¹

It has been recommended to use a variety of techniques and materials to create functional splints that correct ulnar deviation in rheumatoid patients. Compliance with the splinting regimen designed by the therapist can be improved by a number of factors, two of which are thought to be particularly important: comfort and ease of usage.⁶

Therefore, the customized ulnar deviation splint is designed by keeping in mind making it light weighted, comfortable, less cumbersome, cosmetically more acceptable which can be worn easily by RA patients without limiting the entire range of motion.

MATERIALS & METHODS

Research design: A pre-test post-test study design

Intervention period: Immediate effect

Inclusion criteria: Age group 50-70 years, both male and female subjects, diagnosed subjects with RA, subjects having ulnar deviated hand and wrist due to RA, flexible ulnar deviation at wrist and MCP.

Exclusion criteria: Pain, finger deformities i.e. swan neck deformities, boutonniere deformities, rigid deformity at MCP and wrist level, post-surgery cases, cognitive or psychological problems that could influence the study i.e. neurological deficits, tendon ruptures, EDC slippage or sagittal band attenuation.

PROCEDURE

The subjects with rheumatoid arthritis were referred by the rheumatology department of ISIC. After the assessment of the patient as per the inclusion criteria which included age limit from 50 to 70 years of age having ulnar deviation of hand and wrist due to rheumatoid arthritis with flexible ulnar deviation at wrist and metacarpophalangeal joints. Both male and female subjects were recruited in the study. The procedure was explained to the patient in detail and consent was taken. The details of the patient were taken while assuring the patient that their details will be kept confidential. Then initial reading of ulnar deviation at wrist and metacarpophalangeal was taken by goniometer. The designed splint working was demonstrated to the patient. Then the effectiveness of the splint was checked whether it is correcting the ulnar deviation and applying proper corrective forces. Adaptation period of 15 minutes was provided to the subjects, thereafter, immediate reading of ulnar deviation was taken with goniometer. Then post-test reading of comfortability, satisfaction, acceptability, cosmesis and performance of the applied splint on Likert scale was taken. All the data was filled in the data collection form and the average was analyzed to check the immediate effect of the customized ulnar deviation splint.

RESULT

A total of 5 subjects with rheumatoid arthritis participated in the study. Out of 5 subjects who participated in the study with mean age (years) of 60.8. The dominant hand is right.

Mean was calculated to compare the difference in ulnar deviation angle to examine pre intervention and post intervention by goniometer. The differences between the pre-test mean (mean= 20°) and post-test mean (mean=5°) indicated that there were significant differences in ulnar deviation angle after using the customized ulnar deviation splint.

After the application of the splint the post test data for the usability of splint was collected on 5-point Likert scale which included the post-test readings for satisfaction rate of the splint, comfortability of the splint, acceptance of the splint, cosmesis of the splint and performance after using the splint.

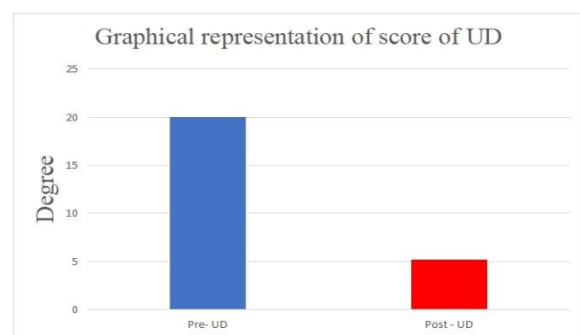
The data of post reading of all the points on Likert scale were as follows:

- 4 out of 5 patients were satisfied with the customized ulnar deviation splint
- All the patients agreed with the comfortable nature of the customized ulnar deviation splint
- But only 3 patients agreed with the acceptance and cosmesis of the customized ulnar deviation splint, whereas the function of the splint was highly accepted by all the patients.

Thus, it indicates that the subjects showed improved ulnar deviation angle and most of the patients were satisfied in terms of comfortability, acceptance and performance of the given orthotic intervention.

Table 1. Comparison of pre and post of ulnar deviation angle

| | Pre-test | Post-test |
|--------|----------|-----------|
| Degree | 20° | 5° |



DISCUSSION

After reviewing the previous literature, it was found that rheumatoid arthritis (RA) is an autoimmune illness associated with progressive impairment. Roughly 75% of cases show involvement of the wrist and fingers, and those affected typically experience symptoms in the hands and upper limbs. Ulnar deviation is the most common hand deformity observed in people with rheumatoid arthritis. For the conservative treatment of ulnar deviation, numerous orthotic solutions are available. Splints are external devices that are applied to a specific body part with the goal of supporting joints and achieving optimal alignment⁷ but some have been reported as being uncomfortable to wear, difficult to put on or preventing full range of movement of the joints involved.⁶

Therefore, in the current study a customized ulnar deviation splint has been designed to assess the acceptance, satisfaction and comfortability in patients with rheumatoid arthritis having ulnar deviation by using the Likert scale as well as to evaluate its immediate impact on the ulnar deviated hand of patient by measuring the ulnar deviation angle pre-test and post-test with the help of goniometer.

The results of present study have given a favorable and satisfactory result regarding deformity correction and made it possible to use the full flexion and extension movements for the fingers and wrist. The ulnar deviation angle was improved from orthotic intervention of customised ulnar deviation splint with significant improvement in post-intervention ulnar deviation angle score mean = 5° as compared to pre-intervention score mean = 20° which indicates significant improvement in ulnar deviation angle. This is supported by study done by H.J. Rennie et al on 'Evaluation of the Effectiveness of a Metacarpophalangeal Ulnar Deviation Orthosis' using a MUD splint in which the greatest angles (14° and 15°) occurred in two subjects. One of these subjects displayed 9° of radial deviation without the

splint and 5° of ulnar deviation with the splint; the other subject had 0° of ulnar deviation and 15° of induced ulnar deviation with the splint.⁵

The customised ulnar deviation splint allows the function of fingers and wrist without hampering the normal activities of patient in daily life as hand is the important aspect of ability to perform the activities of daily living and other functional activities, therefore, patient can easily accept and will easily be satisfied by the customized ulnar deviation splint.

The findings regarding the acceptance, satisfaction, and comfortability of the customized ulnar deviation splint were generally positive. Participants rated their overall satisfaction with the splint on a 5-point Likert scale, with a majority expressing satisfaction. This indicates that the splint met the expectations in terms of comfort and usability, crucial factors for compliance and long-term use in managing RA-related ulnar deviation. In a study done by Ana Carolina Silva et al on 'Effectiveness of a night-time hand positioning splint in rheumatoid arthritis: A randomized controlled trial' mentioned that patient satisfaction with the use of the splint in the SG was evaluated using a Likert scale at T45 and T90. Most patients reported feeling either better or much better with the use of the appliance.⁷

CONCLUSION

The result of the experimental study indicated that there was improvement in ulnar deviation angle after the given orthotic intervention in the subjects with ulnar deviated hand due to rheumatoid arthritis. With the experimental findings, we can conclude here that the customized ulnar deviation control splint is effective in improvement of ulnar deviation angle in the subjects with ulnar deviated hand due to rheumatoid arthritis. This study also assessed the acceptance, satisfaction, comfortability and performance of customized ulnar deviation control splint. Majority of patients reported high level of

satisfaction and acceptance of customized ulnar deviation control splint. Furthermore, most patients found the splint to be comfortable and perceived it as enhancing their performance. Thus, the results support the experimental hypothesis of the study.

Limitations

The research was conducted with a relatively small sample size, which limits the generalizability of the findings. The study focused on assessing the immediate impact of the customized ulnar deviation splint. As a result, the long-term effectiveness and durability of the splint remain uncertain. The immediate impact of customized ulnar deviation control splint was evaluated without a thorough investigation into how it affects the performance of daily functional activities.

Future Directions

A larger, more diverse sample would provide a more comprehensive understanding of the splint's effectiveness across different populations. A more diverse sample can help in understanding how different demographics respond to the splint. Future studies should extend the intervention period to monitor the long-term efficacy and durability of the splint. This will help in identifying any long-term benefits or potential drawbacks that were not evident in the short-term study. Understanding the splint's impact on activities such as gripping, lifting, and other hand functions is essential for evaluating its practical utility.

Declaration by Authors

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