

# To Study the Effect of Home Based Exercise Program (HEP) Verses Institution Based Occupational Therapy (IOT) in Improving Hand Function in Post Operative Colles Fracture

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## ABSTRACT

The fractures usually involve not only the ends of the bone but also the small ligaments in the wrist. This may further decrease stability of the wrist joint & create problems with functioning of the wrist & hand.

The purpose of study is to describe the effect of Home based Exercise Program (HEP) verses Institution based Occupational Therapy (IOT) in improving hand function in post-operative colles fracture.

**Methods:** - Pre test and post test experimental group design was used. By using Convenient sampling method A total number of 40 subjects were selected for the study. 20 patient in group 1 (experimental group) & 20 patient in group 2 (experimental group) all the subjects were recruited from hand section, department of occupational therapy at SVNIRTAR. The subject of **group 1** underwent **IOT** programme along with conventional therapy. The subject of **group 2** underwent **HEP**. The Patient-rated Wrist Hand Evaluation (PRWHE) was developed to assess pain in the wrist joint and functional difficulties in activities of daily living. The results shows  $U=0.000$  &  $Z$  value -4.715 which corresponds to  $p$  value of 0.00 PRWHE score as the  $p$  value is less than set level of confidence ( $<0.05$ ), there is significant difference in PRWHE between the group

**Conclusion:** The result of this study found that there is difference on improvement of hand function of the subjects undergone for IOT & HEP.

Hence the experimental hypothesis was rejected & null hypothesis was accepted. It is concluded that HEP & need based IOT both are not equally effective in improving hand function.

**KEYWORDS:** Colles (Distal radius) fracture neuromuscular function dinner fork' deformity body mass index radial shortening dorsal angulations

## INTRODUCTION

Colles (Distal radius) fracture is one of the most common fracture in people above 40 year of age, and is particularly common in women because of postmenopausal osteoporosis. It most often results from a fall on an outstretched hand. When a fracture occurs then total disturbances happen in between the stable skeletal structure & soft tissues. Displaced fractures must be reduced under anesthesia.

The fractures usually involve not only the ends of the bone but also the small ligaments in the wrist. This may further decrease stability of the wrist joint & create problems with functioning of the wrist & hand. A good understanding regarding the position of fracture & its initial care & proper treatment is needed in order to prevent further complication.

The annual incidence is 8-10 per 1000 person /year, compared with an incidence of hip fractures of 7 per 1000 persons/ year. Such fractures can range from simple undisplaced to complex one/and also involving other soft

tissue structures. They cause significant morbidity only in one study, the finding suggests that only 2.9% of colles' fractures had no permanent disability.

Over a mean follow-up of 7.6 years, 268 women had an incident of wrist fracture and 41 (15%) of these developed clinically important functional decline. Compared with women without wrist fractures, those with incident wrist fractures had greater annual functional decline after adjustment for age, body mass index, and health status. Occurrence of a wrist fracture increased the odds of having a clinically important functional decline by 48% (odds ratio 1.48, 95% confidence interval 1.04 to 2.12), even after adjustment for age, body mass index, health status, baseline functional status, lifestyle factors, co-morbidities, and neuromuscular function.

"Colles' fracture" is still the terminology used for a fracture in which there is an obvious and typical clinical deformity (commonly referred to as a 'dinner fork' deformity) of dorsal

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displacement, dorsal angulations, dorsal comminution and radial shortening.

The majority of distal radial fractures are treated conservatively (non-operatively). This usually involves the reduction of the fracture if displaced, and forearm is immobilized in a plaster cast or brace for around six weeks.

Modern fracture treatment has led to concepts of ORIF that circumvent the multiple disadvantages of long term immobilization. Only within the 21<sup>st</sup> century implants that follow a fixed angle concept have become available, particularly for the distal radius. These proceedings in osteosynthesis systems have brought great progress in progress in achievable levels of stability & have led to consensus that ORIF in instable displaced colles fracture is the treatment method of choice.

A fracture of distal radius often reduces the grip strength by 30% and reduces the range of motion of the wrist joint. Prolonged immobilization causes stiffness from adhesions: these form in the tendons crossing the wrist as well as within the wrist joint and between ligaments.

The fingers must be mobilized early so as to reduce stiffness within the metacarpophalangeal joints and decrease flexor tendon adhesions. <sup>4</sup> 20% of patients have residual symptoms, & 10% have significant functional impairment.

The treatment of distal radius fractures has changed as a result of the experience gained through conservative treatments applied over the last 20 years. Graded strengthening exercises begin once cast is removed. <sup>5</sup>The rehabilitation protocol states that at the end of the immobilization period, it is necessary to proceed to active, passive and counter resistance exercises under the guidance of rehabilitation therapist. <sup>6</sup>

Formal exercises can provide strengthening for weak muscle; functional activity programmes help to translate this to everyday activity and use of the hand.

Rehabilitation is in an integral part because the hand is unique in the human body. Rehabilitation of a fractured distal radius depends on the type of fracture & length of immobilization. The main focus of rehabilitation should emphasize restoring full range of motion & strength while maintaining independence in as much of their activities of daily living.

Delay in treatment or negligence in care increases the problems. If the patient starts treatment immediately, then no problem will occur because early treatment can prevent complications. Early complication are lack of circulation in the fingers & RSD (Reflex sympathetic dystrophy) & late complication are mal union, delayed union, non union, stiffness, tender rupture. It has been seen that maximum patients with colles fracture are in female cases. They are unable to attend clinics regularly due to their household work & also due to sometimes low economic condition also. In this study we had utilized Home exercise program (HEP) to prove the efficacy of HEP which is equally important with Institution based occupational therapy (IOT).

## **RATIONALE**

It has been seen that maximum patients with colles fracture are in female cases. They are unable to attend clinics regularly due to their household work & also due to sometime low economic condition also. Delay in treatment or negligence in care increases the problems after post operative.

So in this study, we had utilized Home Exercise Program to prove the efficacy of HEP which is equally important with Institution based occupational therapy program.

## **AIM OF THE STUDY**

To study the effect of Home based Exercise Program (HEP) verses Institution based Occupational Therapy (IOT) in improving hand function in post-operative colles fracture.

## **HYPOTHESIS**

Home based exercise program & need based institutional occupational therapy both are equally effective in improving hand function in post-operative colles fracture.

## **NULL HYPOTHESIS**

Home based exercise program & need based institutional occupational therapy both are not equally effective in improving hand function in post-operative colles fracture.

## **METHODOLOGY**

### **PLACE OF STUDY**

The study was conducted between SEPTEMBER 2016 and MARCH 2018 at SWAMI VIVEKANAND NATIONAL INSTITUTE OF REHABILITATION TRAINING AND RESEARCH, Cuttack Orissa.

### **STUDY DESIGN**

Pre test and post test experimental group design

### **SAMPLING SIZE AND SAMPLING METHOD**

A total number of 40 subjects were selected for the study. 20 patient in group 1(experimental group) & 20 patient in group 2(experimental group) all the subjects were recruited from hand section, department of occupational therapy at SVNIRTAR, Cuttack over a period of 6 weeks. Informed consent was requested from all subjects who participated in this study. All the subject were tested routinely during their initial assessment.

### **Inclusion Criteria**

Post colle's fracture stiffness  
Open reduction cases  
Sub acute cases  
Above 35yr age  
Both genders

### **Exclusion criteria**

Any psychiatric illness  
Malunion – non-union cases  
Other associated UE fractures  
Any old fracture  
Cognitive issues (MMSE score <19)  
Pain > 5 (visual analogue scale) at rest

**OUTCOME MEASURE:**

**PRWHE:**

**Patient rated wrist hand evaluation (PRWHE):-**

The Patient-rated Wrist Hand Evaluation (PRWHE) was developed to assess pain in the wrist joint and functional difficulties in activities of daily living resulting from injuries affecting wrist joint area.

The PRWHE is a 15 item patient-reported questionnaire. It has two subscales:

1. Pain subscale - 5 items (responses ranging from 0 = no pain to 10 = worst ever)
2. Function subscale - 10 items, which is further divided into:

Specific activities - 6 items (responses ranging from 0 = no difficulty to 10 = unable to do)

Usual activities - 4 items

**PROCEDURE**

Forty subjects who fulfilled the inclusion criteria were selected for the study. The selection of subjects was done by convenient sampling. The patient's parents were explained the purpose of the study and were requested to participate after obtaining the consent form. Selected patients were consecutively assigned to respective groups.

**Group 1 – IOT**

**Group 2- HEP**

Once the subjects were assigned to their respective groups, a baseline assessment was done by PRWHE to obtain the pre scores of both the group.

**PRWHE** – pain and function and

- A. The subject of **group 1** underwent **IOT** programme along with conventional therapy.
- B. The subject of **group 2** underwent **HEP**

**Group -1 IOT**

Contract-relax, Hold-relax, slow reversal and repeated contraction techniques will given for 20min / da, 5 times in a week for 4 wks.

**Contract-relax:** The procedure would be to move the part passively into the agonist pattern to the point where limitation is felt, and at this point, the patient is instructed to contract isotonic ally in the antagonistic pattern. The rotation is resisted as strongly as possible and then instruction is given to the patient to “relax”. It is necessary to lighten the pressure and to wait for relaxation to occur. Having felt the patient “let go”, the part is moved again passively through as much range as possible, to the point where limitation is again felt to occur.

**Hold-Relax:** by performing hold relax to the antagonist with slowly increasing resistance applied to the isometric contraction, relaxation of the antagonist is achieved with resulting stimulation of the agonist.

**Repeated Contractions:** Repeated activity of the weaker component of the pattern is emphasized in this until fatigue is evident in the performance. If the patient cannot move the part voluntarily, less advanced form of repeated contraction is used that involves only isotonic contraction by the use of the stretch reflex as the patient attempts the movement.

Verbal commands are combined with the stretch. That is as stretch is given, “Now” is synchronised with the manoeuvre, and “Pull”, follows immediately for flexion and “Push”, for extension movement. Once the patient is able to perform the less advanced form efficiently, then the more advanced form is introduced in which both isotonic and isometric contractions are used. In this, after the patient has moved initially against resistance, he is instructed to “Hold”, with an isometric contraction where the active motion is felt to be lessening in power. Resistance is maximal but the goal is to encourage the patient to hold rather than to defeat or break the hold.

**Slow-Reversal:** in this process, an isotonic contraction (against resistance) of the antagonist is followed by an isotonic contraction (against resistance) of the antagonist



**Group – 2 HEP**

- Active ROM exercises
- Turning the back & palm of the hand with the elbow fixed at the side.
- Spreading & joining the fingers.
- Bending the wrist with the hand over the side of table.
- Reaching the fingertips with the thumb.
- Reaching the fingerbase with the thumb.
- Bilateral Paper ripping,
- Circular dusting,
- Simple blackboard writing & drawing tasks, various pinching & opposing.

**Activities are graded according to resistance, type of motion &grasp resistance.** Instruction to the subjects Sessions should be 2times for 10min. In a day,5days in a wk, for 6wks.



**DATA ANALYSIS**

The test parameters were compared before & after therapy statistical calculation were performed with SPSS version 25.0. Statistical test were carried within the level of significance set were  $p < 0.05$ .

The score of hand function were measured by PRWHE which data is an ordinal level of measurement. So non parametric

test were used for the comparison of the changes in PRWHE with in both experimental groups & between the groups.

The design of this study was pre test & post test experimental group design. So in non parametric test, Mann Whitney U test were used to analyze the changes in PRWHE scores between the experimental groups & Wilcoxon signed rank test was used to analyze the changes within the group. And independent t test to compare the mean in the group.

**RESULTS**

The analysis of data gives the following tables showing the demographic characteristics & test results. The master chart showing the details of individual's scores on outcome measure for both groups shown in appendix. The individual characteristics of both experimental groups are in table 1.

**TABLE 1: DEMOGRAPHIC CHARACTERISTIC OF SUBJECTS**

SL.NO	Baseline characteristic	Group 1 (experimental grp)	Group 2 (experimental grp)
1	No. of subjects(male & female)	20(m= 6 & f= 14 )	20(m=8 & f= 12 )
2	Age range(years)	35-60yrs	35-60yrs
3	Mean age	46.25yrs	45.35yrs

The table 1 shows mean age of all participants in the study. The mean age of group 1 subjects was 46.25yrs & mean age of group 2 was 45.35yrs.

**TABLE 2: DESCRIPTIVE STATISTICS OF OUTCOME MEASURE:**

Outcome measure	Group 1 (N=20)				Group 2 (N=20)			
	Mean test score		Standard deviation		Mean test score		Standard deviation	
	Pre test	Post test	Pre Test	Post test	Pre test	Post test	Pre test	Post test
PRWHE( pain)	33.15	13.85	8.28616	5.32398	33.20	12.80	8.04249	6.45042
PRWHE(function)	29.45	13.35	8.042449	6.45042	27.20	12.15	7.50158	4.77135

Table 2 showing mean value of pre test & post test score & standard deviation of PRWHE for both the groups. The mean pre test score for PRWHE (pain) was 33.15 & 33.20; the mean post test score for PRWHE (pain) was 13.85 & 12.80 for group 1 & group 2 respectively. The mean pre test score for PRWHE (function) was 29.45 & 27.20; the mean post score for PRWHE (function) was 13.35 & 12.15 for group 1 & group 2 respectively.

The standard deviation pre test for PRWHE (Pain) was 8.28616 & 8.04249; the standard deviation post test for PRWHE (pain) was 5.32398 & 6.45042 for group 1 & group 2 respectively. The standard deviation pre test for PRWHE (function) was 8.042449 & 7.50158; the standard deviation post test for PRWHE (function) was 6.45042 & 4.77135 for group 1 & group 2 respectively.

**Table 3: showing the results of wilcoxon signed rank tests for PRWHE score with in both the groups**

PRWHE score	No. Of subject	Z value	P(2 tailed)	Confidence level
Group 1(pain)	20	-3.925	.000	0.05
Group 1(function)	20	-3.784	.000	0.05
Group 2(pain)	20	-3.925	.000	0.05
Group 2(function)	20	-3.784	.000	0.05

The above result reveals that Z value found from analysis is -3.925 & -3.784 for group 1 & 2 respectively, this value corresponds the value p value of .00 0 which is lesser than the confidence level, which is 0.05 hence there is significant improvement of PRWHE in both groups.

**Table 4: independent T test results between the groups showing p value**

PRWHE score	No. of subjects	95% confidence interval of the difference		T	DF	Sig.(2 tailed)	Confidence interval
		lower	Upper				
Group 1	20	-4.5286	-3.7498	-22.800	14	0.00	0.05
Group 2	20	-2.0400	-1.4471	-12.616	14	0.00	0.05

The above result reveals that 95% confidence interval of the difference (lower -4.5286, upper -3.7498) & (lower -2.0400, upper -1.4471) & t value (-22.800 & -12.616) found from the analysis is for group 1 & group 2 respectively, the value corresponds to value p of 0.00, which is lesser than the set of confidence level, which is 0.05, hence there is significant improvement of PRWHE in both the groups.

**Table 5: Mann Whitney U test results between the groups showing Z & P value**

	PRWHE score
Mann Whitney U	0.000
Z value	-4.715
Asymp. Sig (2tailed)	0.00

Grouping variable group: group not corrected for ties

The results shows U=0.000 & Z value -4.715 which corresponds to p value of 0.00 PRWHE score as the p value is less than set level of confidence (<\_0.05), there is significant difference in PRWHE between the group.

## DISCUSSION

Colle's (Distal radius) fracture is one of the most common fractures in people above 40year of age. The treatment of distal radius fractures has changed as a result of the experience gained through ORIF treatments applied in 21<sup>st</sup> century.

Aim of this study was To study the effect of Home based Exercise Program(HEP) verses Institution based Occupational Therapy(IOT) in improving hand function in post operative colles fracture.

This study was done by taking two groups (group -1 and group -2).The raw score of PRWHE were analyzed for **within** and **between** the Group 1 and Group 2 by using SPSS version 25.

In group-1 (IOT) Proprioceptive Neuromuscular Facilitation techniques (hold-relax, contract-relax, repeated contraction and rhythmic stabilisation) for 30 minutes along with conventional therapy showed significant improvement in result in within the group along with PRWHE in pain and function component score.

In group -2(HEP) strengthening exercises for 20 to 30 minutes showed significant improvement in PRWHE in pain and function component score in within the group.

The results of the study provides experimental data addressing the changes that occurred in hand function in patients with Colle's fracture following 6 weeks of IOT to group-1 and HEP group-2. In the present study it was observed that there was an improvement in hand function in both the groups scored by PRWHE. There was significant improvement within the two experimental groups. But the experimental group 1 showed better improvement on hand function than experimental group 2

### Studies support this result for HEP:-

Gert D. Krischak, MD,et.al (2009) concluded that in the post operative rehabilitation of wrist fractures, instructions in a home exercise program are an effective alternative to prescribed physical therapy treatment.

### Studies support this result for IOT :-

Sukru aydog et.al exclaimed that rehabilitation is of spectacular importance in colles fracture & appropriate rehabilitation program should be applied soon after the orthopaedic manipulation in order to improve hand, wrist & elbow functions.

**But when analyse the difference between** both the experimental groups, group-1 (IOT) and group-2 of (HEP) through SPSS version 25, there was significant difference in between the groups in score of PRWHE pain and function

component. This result may be due to equal effectiveness of both the intervention programs to improve hand function.

### Studies support the result are:-

Sandray kay, Naomi Haensel & kathy stiller (2000)

The study was done on post operative colles fracture shows result to the study when IOT HEP compared with 6wks intervention indicating significant difference between the two groups at the end of 6 weeks and there was significant improvement within the two experimental groups at the end of 6 weeks. But experimental group 1 showed better improvement than experimental group 2 on hand function. By the help of this study we concluded that both strengthening IOT and HEP techniques are not equally efficacious methods of improving hand function.

Hence the Experimental hypothesis is rejected and Null hypothesis is proved.

## CONCLUSION

The result of this study found that there is difference on improvement of hand function of the subjects undergone for IOT & HEP.

Hence the experimental hypothesis was rejected & null hypothesis was accepted. It is concluded that HEP & need based IOT both are not equally effective in improving hand function.

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