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Comparison of Coventional Therapy V/S Conventional Therapy with Mirror Therapy in Distal Radius Fracture Patient

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INTRODUCTION

Distal radius fracture is the most common orthopaedic injuries accounting for upto 15% of all extremity fractures. Its annual incidence has been estimated with a ratio of 4:1 (women > men due to post menopausal osteoporosis). It is predominantely seen in older population having increased number of falls that is fall on an out stretched hand.

Distal radius fracture's fracture line usually runs transversely at the cortico-cancellous junction. There could be injuries associated with Colle's fracture that is fracure of ulna styloid process, ulna collateral ligament rupture, rupture of ulna triangular cartilage. The patient presents with swelling, tenderness along with deformity of wrist and irregularity at lower end of radius. These fractures are also important as they could be associated with a high incidence of serious complications like complex regional pain syndrome (CRPS), carpal tunnel syndrome, Sudeck's osteodystrophy, tendons and ligament injuries.

Management for Colle's fracture depends on the degree of displacement of the fracture. For undisplaced fracture, immobilisation in a below-elbow plaster cast for 6 weeks is sufficient. For displaced fractures, the standard method of treatment is manipulative reduction followed by immobilisation in Colle's cast. This reduction technique includes counter-traction at the elbow, traction at the wrist, dorsal tilt correction and finally radial tilt correction. An X-ray is taken to check the success of closed reduction. The patient is encouraged to move his fingers as soon as the plaster dries. The plaster is removed after 6 weeks and joint mobilising and muscle strengthening exercises started for the wrist and fingers. In comminuted fractures, they are transfixed percutaneously using two K-wires which are incorporated in the plaster cast. At times, an external fixator is used to keep the fracture distracted, so that the stretched ligaments and periosteum keep the comminuted fractures in place. Rehabilitation is crucial for reducing pain and speed up functional recovery. There are conventional therapeutic methods being used for diminishing pain and improving range of motion. For pain and swelling electrotherapeutic modalitites such as ultrasound, TENS and IFT keeping in mind the necessary contraindications. Joint mobilisation and hand activities like use of theraputty and dumbells for improving the strength of elbow and hand muscles.

Mirror therapy was first introduced by Ramchandran and Hirstein to treat phantom limb pain after amputation. Since then it has also been applied to treat complex regional pain syndrome patients (CRPS) and upper limb impairment in stroke patients. However, there is little published research on the application of mirror therapy in rehabilitation in orthopaedic disorders. Mirror therapy has been used after median nerve repair and hand surgery, allowing patients to recover hand coordination, grip strength and active finger flexion. However, few studies have been addressed to research whether the application of mirror therapy could be useful in patients with distal radius fracture.

Mirror therapy is a simple inexpensive rehabilitation technique in which a mirror is positioned between unaffected and affected hand, blocking the patient's view of the affected hand. The patient performs exercises using both the limbs and reflection of the unaffected limb movements in mirror creates a visual illusion of enhanced movement capability in affected limb. The mirror visual feedback contibutes in improving wrist and hand motor function this occurs through activation of superior temporal gyrus, premotor cortex, mirror neuron system and areas asssociated with allocation of attention and cognitive control (dorsolateral prefrontal coretx and posterior cingulate cortex).

The aim of this study is to investigate mirror therapy programme if added to usual rehabilitation care is effective in order to increase range of motion, reduce pain and enhance functional recovery for patients in distal raius fracture.

HYPOTHESIS
NULL HYPOTHESIS**:** There is no effect of mirror therapy in recovery of distal radius fracture.
ALTERNATE HYPOTHESIS**:** Mirror therapy does help in improving the wrist function in distal radius fracture

AIM AND OBJECTIVES
AIM:
To compare the effect of mirror therapy in conjunction with conventional therapy in distal radius fracture.

OBJECTIVES:
1) To compare the effect of pre and post conventional therapy
2) To compare the effect of pre and post mirror therapy + conventional therapy.
3) To compare the effect of post treatment of mirror therapy + conventional therapy v/s conventional therapy.

REVIEW OF LITERATURE

1. Manuel Bayon-Calatayud, Ana Maria Benavente-Valdepenas and Maria del Prado Vazquez-Munoz did study on **"Mirror therapy for distal radius fractures: A pilot randomised controlled study"** and published on August 2016 in J Rehabilitation Med 2016; 48: 829-832. They concluded that mirror therapy was not superior to conventional therapy in reducing pain and disability.

2. Abolfazli, Mahsa & Lajevardi, Laleh & Mirzaei, Leila & Ali Abdorazaghi, Hosein & Azad, Akram & Taghizadeh, Ghorban did study on **"The effect of early intervention of mirror visual feedback on pain, disability and motor function following hand reconstructive surgery: a randomized clinical trial"** and published on November 2018 in Clinical Rehabilitation. They concluded that mirror visual feedback had a positive effect on pain, range of motion (ROM) and dexterity.

3. Hamid Reza Rostami, Ahmad Arefi & Saeed Tabatabaeidid study on**"Effect of mirror therapy on hand function in patients with hand orthopaedic injuries: a randomized controlled trial"**and published on 22nd January 2013 in Disability and Rehabilitation,Volume 35, Issue 19. They concluded that mirror therapy combined with conventional therapy produced more improvement in hand function than control group.

METHODOLOGY
Study design**:** Experimental study
Study set up**:** Clinics and hospital in Mumbai and Navi Mumbai
Sample size**:** 12 subjects in each group
Group A: Experimental group
Group B: Conventional group
Inclusion criteria**:**
Patients with 4 weeks post closed distal radius fracture who are operated or managed conservatively
Exclusion criteria**:**
Patients with hemiplegia neglect, apraxia or peripheral nerve injury.
Study procedure and Intervention**:**
Two group with 12 subjects in each group
Participants will be assessed and written consent form will be taken.
Hot pack will be given to the hand
Duration – 30 to 40 mins, 5 days a week
Both groups were given same set of conventional exercises except group A that is experimental group will receive mirror therapy in addition.
a) Stretching for wrist flexors.
b) Joint mobilisation for wrist flexion and extension, DIP and PIP joints. (grades depending on the severity of pain)
c) Muscle energy technique (MET) for tightened muscle.

d) Strengthening of wrist flexors and extensors with the help of dumbells ½ kg, bottle filled with water 3sets of 10 repetitions each
e) Strengthening of finger flexors / extensors and lumbricals and interossei with the help of theraputty, springs, elastic band
f) Participants from experimental group were seated close to a table in which a mirror box was positioned vertically. The affected hand was placed into the mirror box and unaffected hand was placed in front of the reflective mirror surface. According to this procedure, patients from mirror therapy practiced active wrist movements and grip and grasp activities and task oriented exercises.

OUTCOME MEASURE
1. Visual analog scale (VAS)
2. Disabilities of arm, shoulder and hand (DASH)
3. Goniometer for assessing the range of motion.
VAS, DASH and range of motion will be assessed pre and post treatment in both groups.

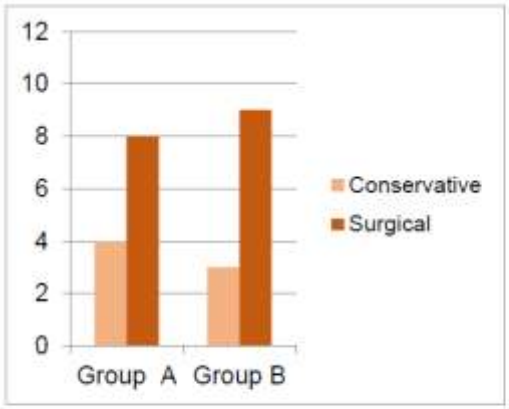
STATISTICAL ANALYSIS

PARAMETRIC TEST

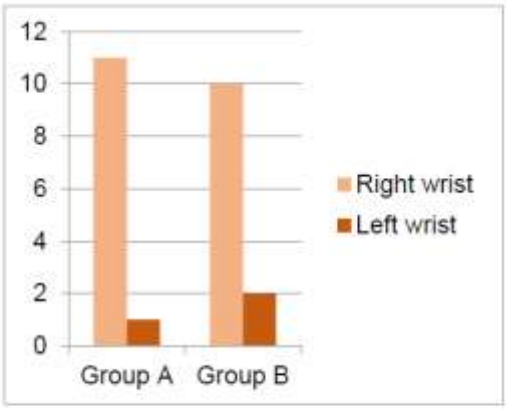
The test used for comparing pre and post range of motion (ROM) was paired and unpaired t test.
The test used for comparing post range of motion (ROM) for group A and B was paired and unpaired t test.

NON PARAMETRIC TEST

The test used for visual analog scale (VAS) and disabilties of arm, shoulder and hand (DASH) was Wilcoxon signed-rank test.

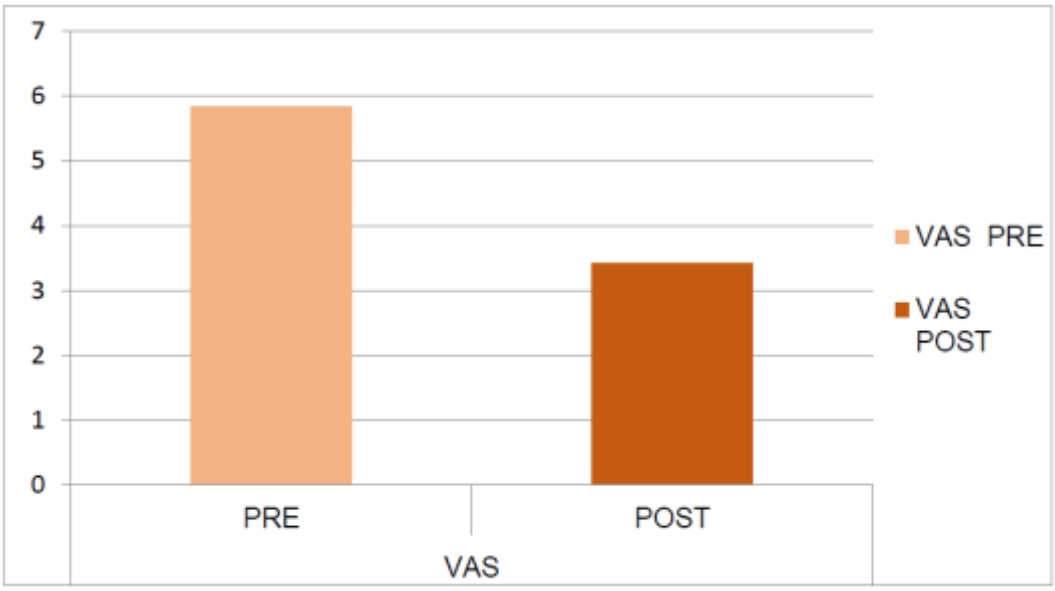


Above graph shows management for Colle's fracture in group A and B



Above graph shows the involved side in group A and B

VAS OF GROUP A PRE AND POST TREATMENT

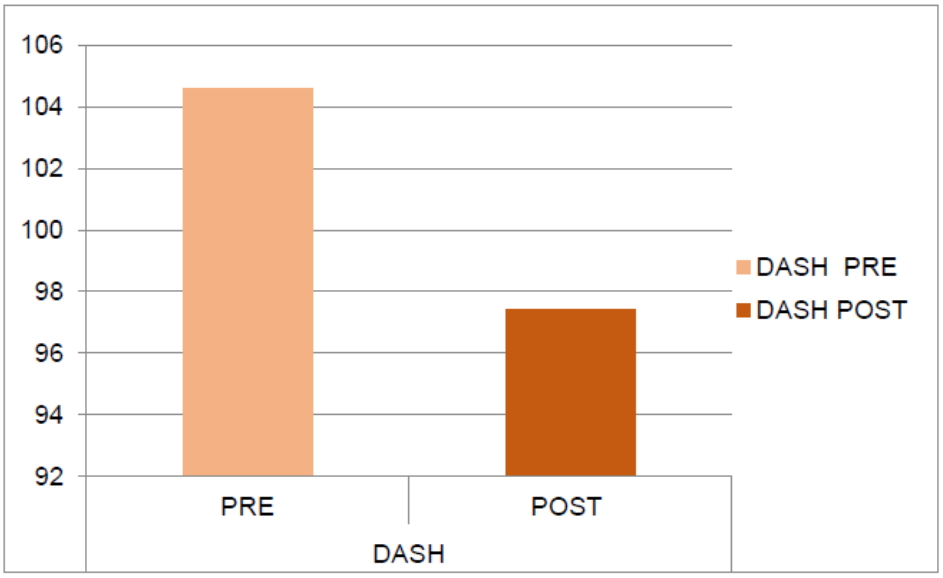


	PRE VAS	POST VAS
MEAN	5.833	3.416
S.D.	1.267	1.505

P value – 0.0005 (extremely significant)

Inference – There is reduction in VAS post treatment in group A

DASH OF GROUP A PRE AND POST TREATMENT

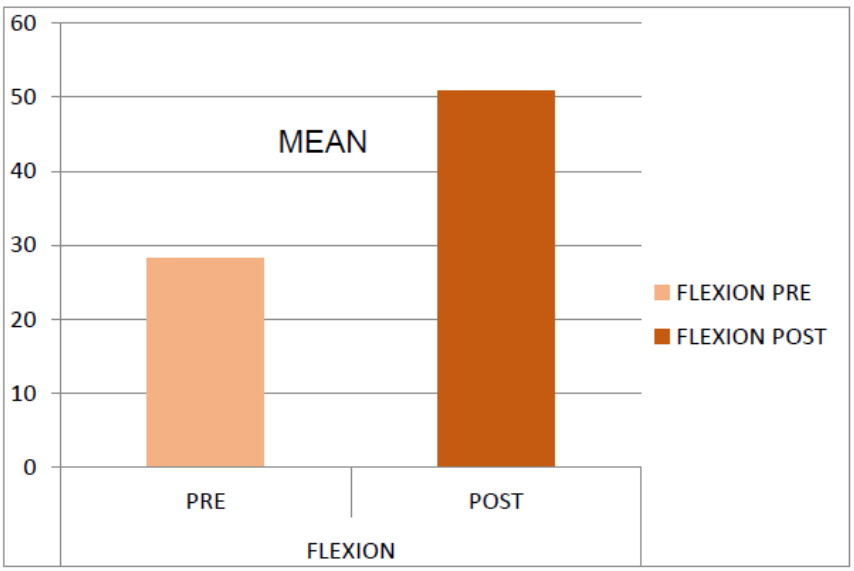


	PRE DASH	POST DASH
MEAN	104.58	95.58
S.D.	11.429	11.204

P value – 0.0005 (extremely significant)

Inference – There is an improvement in DASH score post treatment in group A.

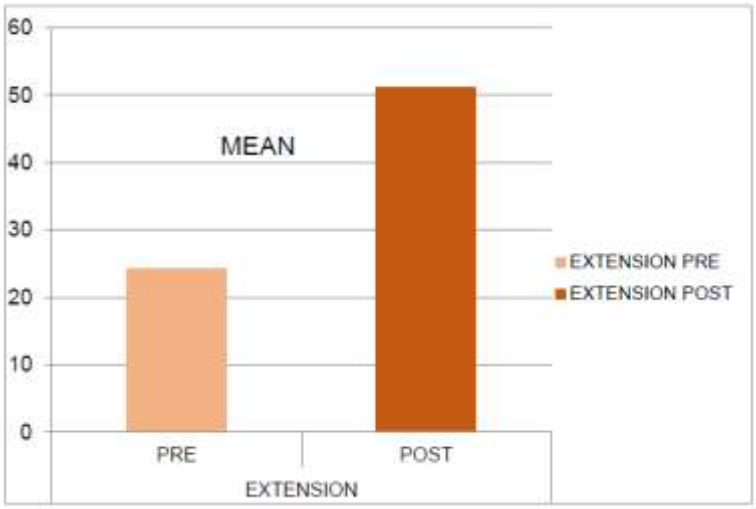
FLEXION ROM OF GROUP A PRE AND POST TREATMENT



	PRE FLEXION	POST FLEXION
MEAN	28.16	50.83
S.D.	7.158	5.851

P value – 0.0002 (extremely significant)
Inference – There is an improvement in flexion range of motion post treatment in group A.

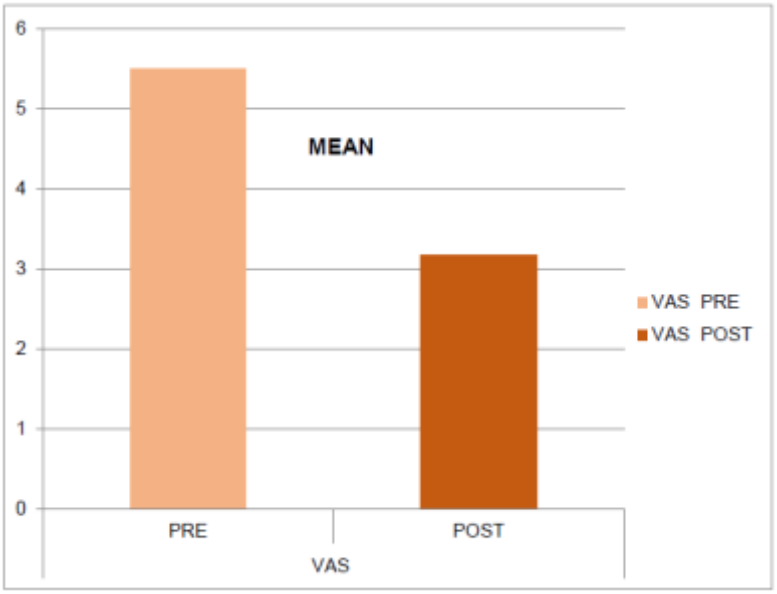
EXTENSION ROM OF GROUP A PRE AND POST TREATMENT



	PRE EXTENSION	POST EXTENSION
MEAN	24.33	52.3
S.D.	8.78	5.997

P value – 0.0005 (extremely significant)
Inference – There is an improvement in extension range of motion post treatment in group A.

VAS OF GROUP B PRE AND POST TREATMENT

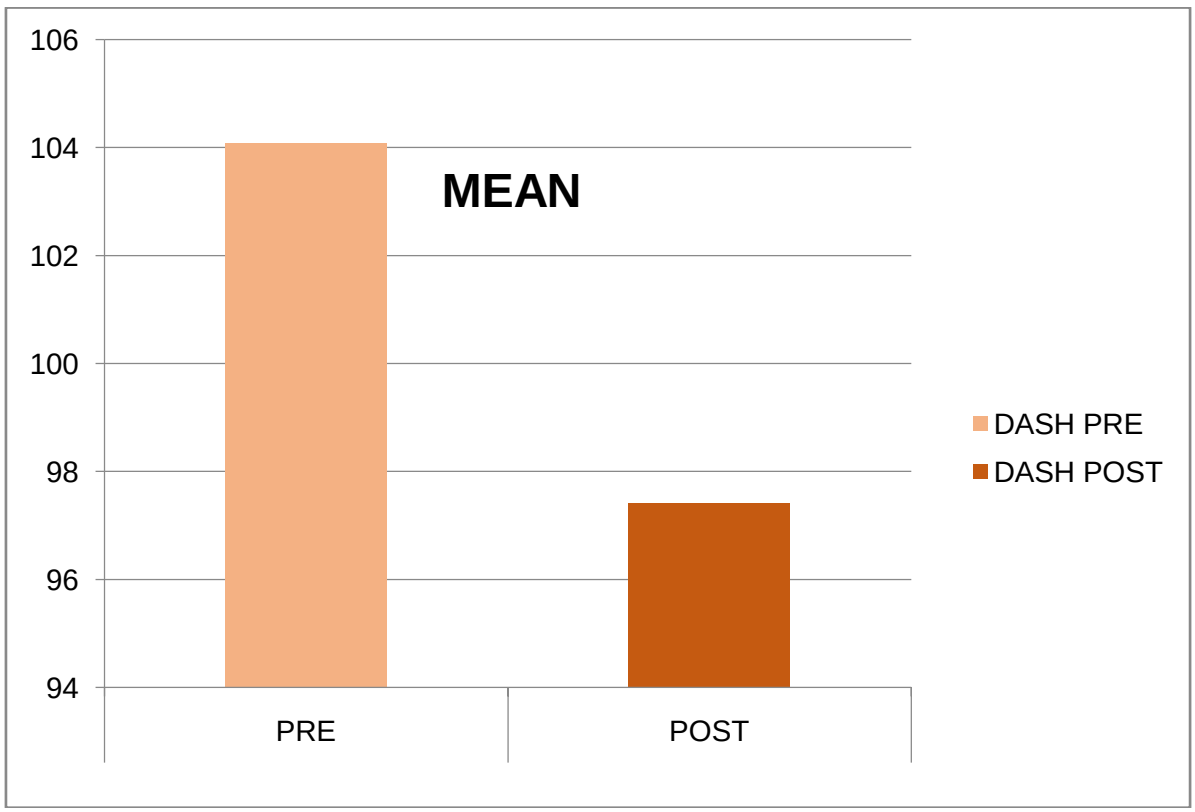


	PRE VAS	POST VAS
MEAN	5.5	3.166
S.D.	1.087	0.937

P value – 0.0005 (extremely significant)

Inference – There is a reduction in VAS post treatment in group B

DASH OF GROUP B PRE AND POST TREATMENT

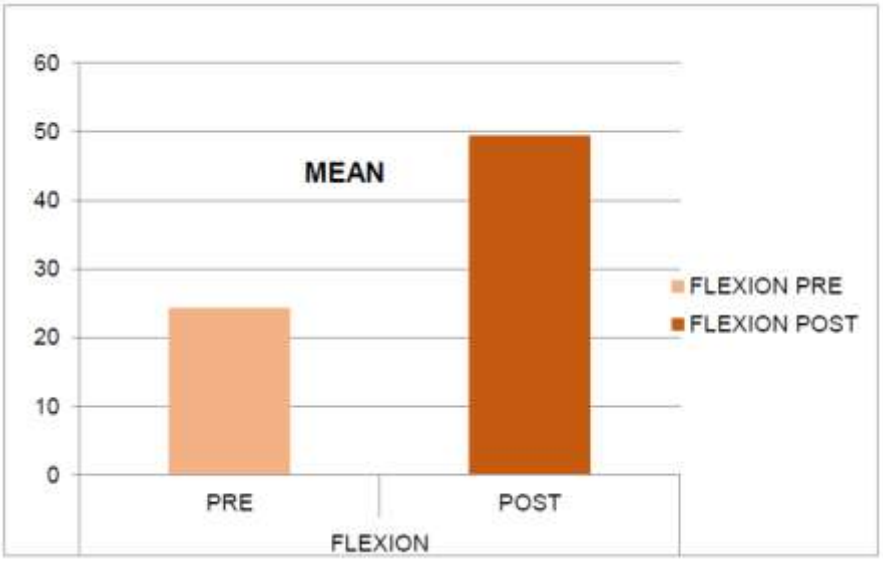


	PRE DASH	POST DASH
MEAN	104.083	97.42
S.D.	13.594	14.031

P value – 0.0001 (extremely significant)

Inference – There is an improvement in DASH score post treatment in group B

FLEXION ROM OF GROUP B PRE AND POST TREATMENT

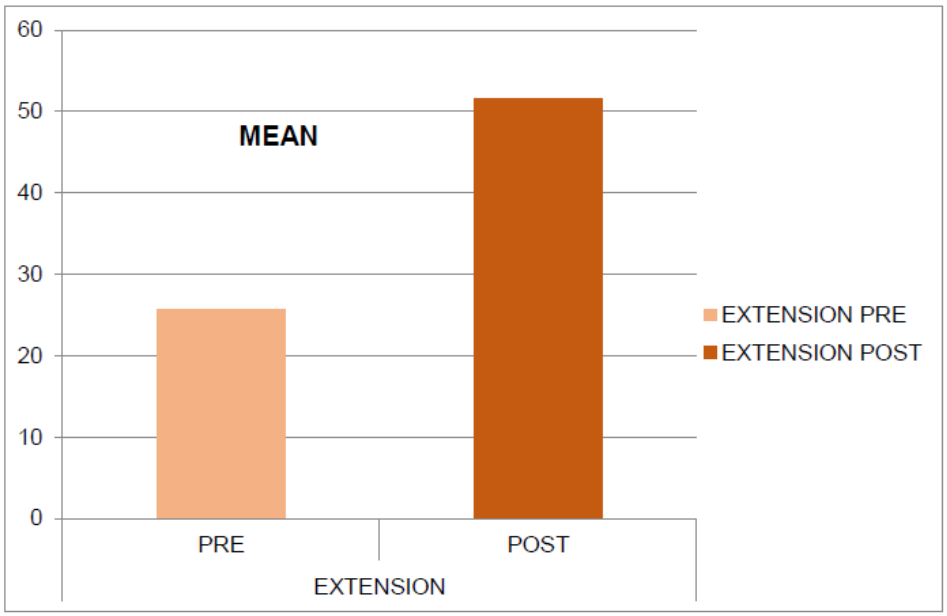


	PRE FLEXION	POST FLEXION
MEAN	24.33	49.33
S.D.	5.851	7.98

P value – 0.0179 (extremely significant)

Inference – There is an improvement in flexion range of motion post treatment in group B

EXTENSION ROM OF GROUP B PRE AND POST TREATMENT

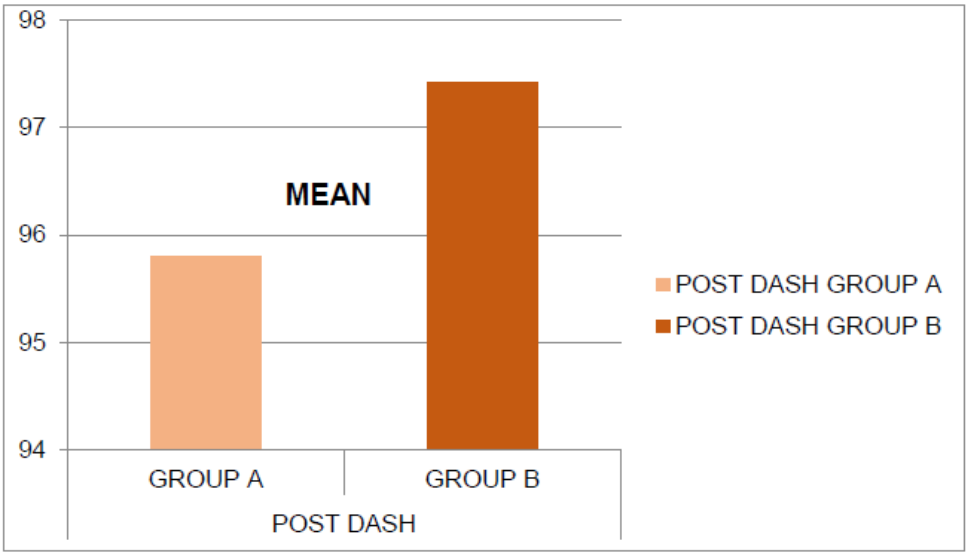


	PRE EXTENSION	POST EXTENSION
MEAN	25.66	51.66
S.D.	7.81	8.78

P value – 0.0456 (significant)

Inference – There is an improvement in extension range of motion post treatment in group B

DASH OF GROUP A AND GROUP B POST TREATMENT

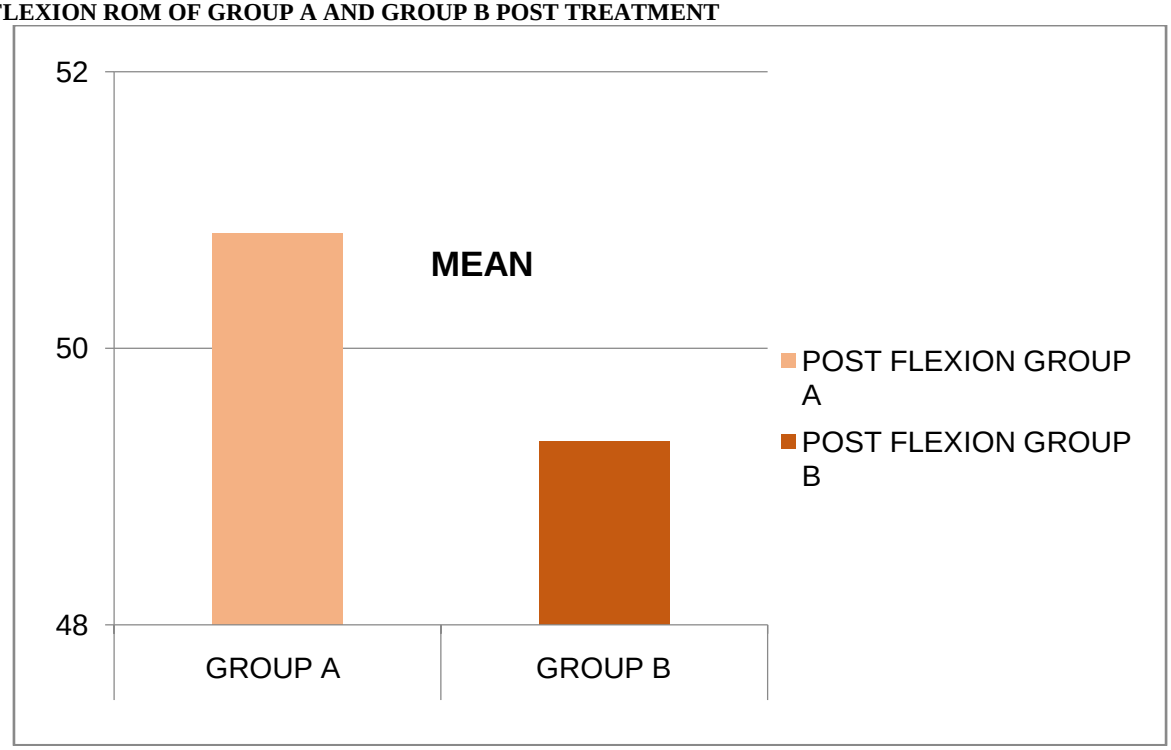


	POST GROUP A DASH	POST GROUP B DASH
Mean	95.58	97.42
S.D.	11.20	14.03

P value - 0.7270 (not considered significant)

Inference – There is no significant change in DASH post treatment in group A and B.

FLEXION ROM OF GROUP A AND GROUP B POST TREATMENT

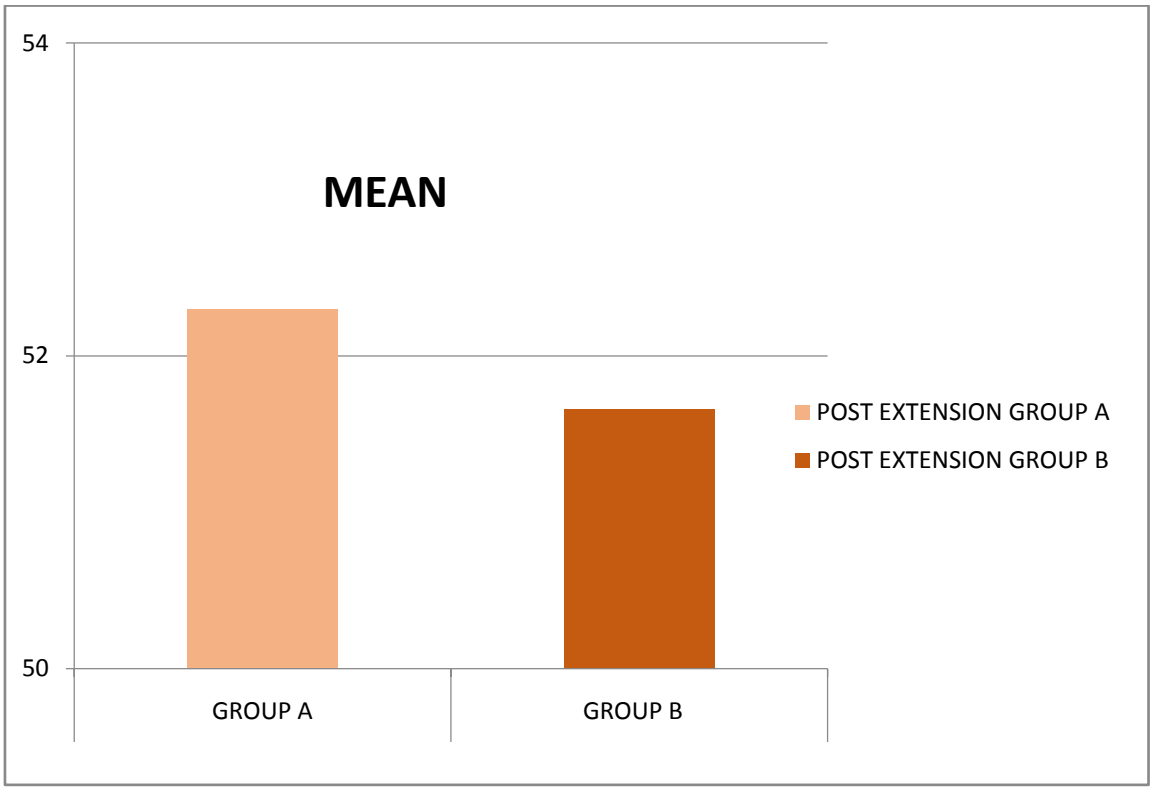


	POST GROUP A FLEXION	POST GROUP B FLEXION
MEAN	50.83	49.33
S.D.	6.027	7.98

P value – 0.0251 (significant)

Inference – There was significant change in flexion ROM post treatment in group A and B.

EXTENSION ROM OF GROUP A AND GROUP B POST TREATMENT



	POST GROUP A EXTENSION	POST GROUP B EXTENSION
MEAN	52.3	51.66
S.D.	5.807	7.98

P value – 0.4551 (not considered significant)

Inference – There is no significant change in extension ROM post treatment in group A and group B

DISCUSSION

This study was conducted in an attempt to see the effect of mirror therapy with conventional therapy in distal radius fracture patients. Clinically there was an improvement in range of motion (ROM) and reduction in pain in both the groups post treatment. However active wrist flexion range of motion showed a positive effect with mirror therapy and conventional therapy while active wrist extension range of motion had no significant change.Active wrist extension range of motion (ROM) had no significant change with mirror therapy and conventional therapy and this could be supported by a pilot randomised study that was published in the year 2016 conducted in Spain concluded that there was no significant difference change in active wrist extension. This takes place due to visual illusion that creates a positive feedback thereby increasing the primary motor cortex excitability of affected wrist and thus activates brain areas i.e. precuneus and cingulate cortex associated with awareness of the affected limb.Mirror therapy had a positive effect on flexion range of motion (ROM) of wrist and this could be supported by randomised controlled trial study that was conducted in the year 2013 by Hamid Reza Rostani regarding the effect of mirror therapy on hand function in patients with hand orthopaedic injuries which concluded that mirror therapy given in conjunction conventional therapy produced more

improvement in hand function. Also it says that mirror therapy provides percepton of two healthy limbs through reflection of as the injured limb.

Another study conducted by Mahsa Abofazli on the effect of early intervention of mirror visual feedback on pain, disablity and motor function following hand reconstruction surgery showed that mirror therapy had a positive effect via mirror visual feedback (MVF) on pain and range of motion (ROM)

Also in this study improvement is seen more in active wrist flexion than active wrist extension, this could be because most of the daily activities take place in flexion range of motion (ROM) thus aiding in improving the flexion range of motion and a speedy functional recovery.Moreover, visual illusion during mirror therapy could generate positive feedback to the motor cortex, modulating cortical mechanisms of sensation and movement. Mirror visual illusion increases primary motor cortex excitability of the affected wrist behind the mirror, and at the same time activates brain areas (precuneus, cingulate cortex) associated with awareness of the affected limb reducing the learned non-use phenomenon.

CONCLUSION

The study demonstrated showed that mirror therapy in conjunction with conventional therapy had an improvement in flexion range of motion (ROM) in distal radius fracture patients.

STUDY LIMITATION

1. Sample size is small
2. Lack of follow up
3. Short treatment duration
4. Absence of immediate post treatment follow-up

CLINICAL APPLICATION

Since there was recovery seen using mirror therapy with conventional therapy so mirror therapy could be used as a part of protocol for treating distal radius fracture patients. Also, mirror therapy could be given as a home program to the patients in conjunction with other activities by explaining them the procedure and required repeptitions to do exercises. This will aid in their speedy recovery and going back to their daily activities faster.

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