



## CASE REPORT

### VIRTUAL REALITY – BASED REHABILITATION PROGRAM FOLLOWING DISTAL RADIUS FRACTURE: A NOVEL APPROACH FOR SINGLE CASE STUDY

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#### ABSTRACT

##### Background:

Fracture of the distal radius and its incidences are very prominent in the elderly aged population mostly due to osteoporotic changes in the bone. This type of fracture are seen to be commonly treated fractures in India. As the ageing population is increasing these fracture numbers are also continues to increasing. If it is a displaced fracture palmar locking plate and fixation in cast for 4 to 6 weeks, if non-displaced immobilization and cast fixation is enough.

##### Case Presentation:

We report the 56 year old, post-menopausal female, with history of fall on the left side with arm by side and sustained a fracture of distal radius. On evaluation of patient, there was over all swelling including the distal and proximal forearm with no signs of neuro-vascular injury. Radiological investigations verify that it is non displaced fracture of distal radius, and managed conservatively with k wire fixation. After the physiotherapy rehabilitation, functional parameters were reported well.

##### Discussion:

Several physical therapy rehabilitation have described following distal radius fracture, but, for our knowledge, virtual reality based physical therapy treatment has not been reported directly for treatment of distal radius fracture.

##### Conclusion:

Virtual reality based exercises program are very helpful in non-exhausting patient rehabilitation, post distal radius fracture patient.

**Keywords:** Distal radius fracture, virtual reality, rehabilitation, physical therapy, case report.



## INTRODUCTION

Distal radial fracture in the ageing population are simply very common at the incidence rate of 12 per 75 and 27 per 100 peoples per year[1].Very rare literatures are available on the rehabilitation of the fracture of distal radius in association with the virtual reality. Previous literature shows the virtual reality have emerged into the rehabilitation program of the various neurological conditions like stroke [2]. Virtual reality is really transforming the medical education in the form of allowing the learners to apply the practical knowledge and also it focuses on the lacking competencies of the learner [3]. In last few years use of virtual reality in the field of medical education is increased, and it is used for better understanding of the subject, immersive aspect of learning and also it creates the simulation environment for almost every possible medical module [4]. In the present case study we have use head mounted device name oculus quest as a virtual reality delivery kit in the management of the distal radius fracture.

## CASE DESCRIPTION

A 56 year old women, with menopausal history since last 3 years, brought to the emergency department following the low energy fall at the home. Patient later on evaluated for her present complaint of pain in left side of forearm. In the physical therapy examination, the patient had dinner fork deformity in the left sided forearm. There was a grade 3 tenderness on the distal 1/3<sup>rd</sup> part of the radius. Other neurological evaluation was done and there were no obvious findings. She had type 2 diabetes mellitus since last 2 years and no other medical condition. On the radiographically x – ray assessment of Antero-posterior radiograph verify and confirmed the diagnosis of distal radius fracture (Figure 1).Surgical treatment of closed reduction the k-wire fixation for distal radius were planned and executed.

Shoulder and elbow range of motion exercises were begun post 1 week of surgery with head mounted device called oculus quest. It has immersive experience with task oriented approach for the movements of the arm. It has various task which includes the shoulder – flexion, abduction, adduction, and elbow – flexion extension and wrist movements. After about 3 to 4 weeks of fixation achievement, wrist flexion and extension movements was started. After 6<sup>th</sup> week the k-wire fixation was removed after complete achievement of distal radius fracture, and later on no complications were observed.



Figure 1: Radiographic Image arrow showing fracture of distal radius segment.

Till the time of three months 3 days per week virtual reality based rehabilitation program were given to the patient. At this time left shoulder 180 degrees of flexion and abduction, extension and adduction were full, left side elbow having full range of movement. Left side wrist plantar flexion and was 55 degrees and dorsiflexion was 50 degrees. There were no complaints about other stiffness of pronation as well as supination movements. DASH score was calculated as to check for the disability of arm and hand.



Figure 2A & 2B: Patient performing exercises with head mounted device Oculus Quest.



## DISCUSSION

As the distal radius fracture is very common type of the upper extremity injury to elderly population, but virtual reality based rehabilitation program literature are very rarely available.

Cengiz et al. [5] presented a rare case of distal radius fracture with olecranon fracture with ipsilateral injury in the same extremity in 2015. Radiographic images have shown that there was complete fracture of the olecranon and the distal radius. They have made open reduction and k-wire fixation for 6 weeks. On the physical therapy examination on the 3<sup>rd</sup> month and 6<sup>th</sup> month elbow motion was 130 degrees and wrist movements were 60 degrees to 65 degrees of pronation and supination. We almost had 20% more result and compare to better functional outcome.

Ravi et al. [6] made a systematic review in the use of virtual reality in the rehabilitation in 2017 to provide the readers about the latest available knowledge about the virtual reality rehabilitation in the sensory and the functional motor skills of the children with cerebral palsy. As there are literatures available for the use of the virtual reality for the rehabilitation, we have thought the use of the head mounted device oculus quest in the rehabilitation of the distal radius fracture patient.

## CONCLUSION

In Conclusion, Virtual reality based exercises program are very helpful in non-exhausting patient rehabilitation, post distal radius fracture patient.

## CONFLICT OF INTEREST

Authors declares that there are no conflict of interest.

## FUNDING

None Received.

## ETHICAL APPROVAL

The case report was written based on the institutional ethical guidelines and written consent were obtained from the patient for the publication of this report.



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