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FUNCTIONAL RECOVERY AFTER DELAYED REHABILITATION OF DISTAL HUMERUS ORIF IN A PATIENT WITH CEREBRAL PALSY AND INTELLECTUAL DISABILITY: A CASE REPORT

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ABSTRACT

Distal humerus fractures are complex intra-articular injuries commonly managed with Open Reduction and Internal Fixation. Post-operative elbow stiffness is a frequent complication, particularly when immobilisation is prolonged or rehabilitation is delayed. Recovery may be further complicated in individuals with pre-existing neurological conditions such as cerebral palsy and intellectual disability. A 54-year-old right-hand dominant female with a history of cerebral palsy and moderate intellectual disability sustained a distal humerus fracture following a fall and underwent ORIF. The elbow was immobilised for three months, and structured physiotherapy was not initiated until approximately five months post-operatively. On assessment, the patient presented with pain (6/10), marked restriction of elbow range of motion, extension lag of 15°, reduced muscle strength (Grade 3), and significant functional limitations in activities of daily living. A structured 12-week physiotherapy program was implemented, consisting of phased manual therapy, progressive resistance training, and task-oriented functional rehabilitation delivered 4–5 sessions per week. Following intervention, pain resolved (0/10), active elbow flexion improved from 15°–60° to 0°–110°, extension lag resolved completely, passive range of motion increased significantly, and muscle strength improved to Grade 4+. Functional ability, measured using the Patient-Specific Functional Scale, improved from 3 to 8. No adverse events were reported. This case demonstrates that substantial functional recovery is achievable even when physiotherapy is initiated in a delayed post-operative period, including in patients with neurological comorbidities. Structured, progressive, and task-oriented rehabilitation remains effective in restoring mobility and independence despite delayed intervention.

INTRODUCTION

Distal humerus fractures are complex intra-articular injuries that occur when an individual falls onto an outstretched hand,resulting in a fracture of the distal humerus.(1) These fractures can result in post-surgical complications such as contractures and limited Range of Motion (ROM). Post-traumatic elbow joint stiffness is also common in distal humerus fractures, especially if immobilisation occurs for a long time or if rehabilitation begins too late after surgery. (2)

Although Open Reduction and Internal Fixation (ORIF) remain the gold standard treatment for restoring anatomical alignment and joint congruity of distal humerus fractures, successful restoration of anatomical alignment and prevention of post-surgical complications largely depend upon the early implementation of a well-structured program of physiotherapy. (3)

Distal humerus fractures treated using ORIF will generally have good clinical outcomes when followed by an appropriate and timely program of progressive physiotherapy. Delayed implementation of physiotherapy and prolonged periods of immobilisation will significantly increase the likelihood of

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developing post-traumatic elbow joint stiffness. (4)

Individuals with pre-existing neurological impairmentspresent unique challenges during the rehabilitation process for distal humerus fractures. Individuals with impaired motor control and altered coordination will find it difficult to participate fully in the rehabilitation process, and their cognitive limitations might limit their ability to understand the rehabilitation process and actively participate in it. (5)This patient had difficulties with motor control, comprehension, and regular active participation in therapy due to additional factors butover the course of the 12-week rehabilitation period, the patient showed quantifiable improvements in pain levels, ROM, muscle strength, and functional abilities. The purpose of this case report is to describe the functional results of delayed structured physiotherapy in a patient with pre-existing cerebral palsy and intellectual disability after distal humerus ORIF, and it follows the SCARE checklist.

PATIENT INFORMATION

A 54-year-old right-hand dominant female residing in a long-term care facility, with a known case of moderate intellectual disability (ICD-10 code F71)(6) and cerebral palsy diagnosed at 2.5 years of age, sustained a fall on her left upper limb approximately eight months before presentation. Following the injury, she was taken to a tertiary care hospital, where radiographic evaluation confirmed a distal humerus fracture. She subsequently underwent ORIF. Postoperatively, the limb was immobilised in a cast for a duration of three months.

Due to the residential facility's lack of access to rehabilitation, no structured physiotherapy intervention was started following cast removal. The patient's left upper limb became increasingly stiff and functionally limited over time. Regular rehabilitation services were started after our institution identified the patient during a physiotherapy outreach program at the residential care facility.

CLINICAL FINDINGS

On physical examinationvisible gunstock deformity (cubitus varus) of the left elbow (figure 1) was present. The wrist was in a semi-flexed posture. The surgical scar over the posterior aspect of the elbow was healed. Palpation revealed mild tenderness (Grade 1) around the olecranon process. The patient reported moderate pain (6/10) on the Wong-Baker FACES Pain Rating Scale during movement, with no pain at rest.Muscle tone was normal in both upper extremities, andsensations were intact. ActiveROM of the left elbow flexion was 15° to 60°, and extension was limited to 15° (extension lag of 15°). The Passive ROM was more restricted at the end range. End-feel was hard capsular. Manual muscle testing showed elbow flexors grade3 and elbow extensors grade -3. Joint play assessment revealed hypomobility (Grade II). No limb length discrepancy was noted. Grip strength appeared functionally adequate.

DIAGNOSTIC EVALUATION

Radiographic evaluation of the left elbow demonstrated a distal humerus fracture managed with open reduction and internal fixation using a plate and multiple screws. The radiographs showed alignment of the distal humerus and appropriate implant positioning. (Figure 2)Assessment was limited by the patient's moderate intellectual disability; according to clinical examination, it was post-operative elbow stiffness with periarticular contracture following prolonged immobilisation after surgery.

THERAPEUTIC INTERVENTION

The patient underwent a structured physiotherapy rehabilitation program for a duration of 12 weeks, with a dosage of4–5 sessions per week. Each session lasted 45–60 minutes. Weekly ROMand Muscle Strength were recorded to monitor progress and guide treatment progression.

Phase I (Weeks 1–4)

Goal: Pain Reduction and Mobility Restoration

The main goals of the first stage were to reduce pain and improve range. The interferential therapy was used as an adjunct modality. Sweepfrequency mode with quadripolar electrode placement around the elbow joint was used.(7)a medium frequency alternating current therapy that reportedly reduces skin impedance, can reach deeper tissues. IFC therapy can provide several different treatment possibilities by adjusting its parameters (carrier frequency, amplitudemodulated frequency, sweep frequency, sweep mode or swing pattern, type of application (bipolar or quadripolar To enhance joint play and reduce capsular stiffness, 2-3 sets of anterior and posterior glides were given using Maitl and Grade I–II mobilizations. Passive movements were started within painfree range, and then the contralateral limb was used for an active-assisted range of motion.(8)Gentle sustained stretching was performed at the end range. Submaximal isometric contractions of elbow flexors and extensors were started with 2 sets of 8-10 reps to prevent further muscle deconditioning.

Phase II (Weeks 5–8)

Goal: Active Control and Strength improvement

The next goal was Active Control and Strengthening. Sessions started with ROM exercises followed by 2-3 sets of Maitl and Grade II–III mobilisations.(8)Muscle Energy Techniques (reciprocal inhibition) was used with a dosage of 5-second hold, 8–10 repetitions, followed by passive stretching. Manual resistance was used to start strengthening. External weights were added depending on the patient's tolerance. (9)Functional movement patterns were introduced as task-oriented reaching. (10)

Table 1. Timeline of Events

Timeline of Events	
Dates	**Event**
23-12-2024	Fall on an outstretched hand
24-12-2024	An X-ray investigation was done
27-12-2024	ORIF Surgery for fracture reduction
28-12-2024	Cast immobilization to elbow was given
03-03-2025	Cast was removed
20-05-2025	Physiotherapy Treatment Started
The delay between cast removal and physiotherapy initiation was approximately 2.5 months, and the total delay from surgery was approximately 5 months.	

Phase III (Weeks 9–12)

Goal: Strengthening and Functional Reintegration

Progressive Resistance Exercises (PRE) were initiated at approximately 30% of the estimated one-repetition maximum and gradually increased as tolerated. An assisted wall-supported push-up was started as a closed kinetic chain activity to enhance joint stability and neuromuscular control.(11)End-range mobilisation techniques followed it.(8)Functional task simulation was initiated by incorporating grooming and upper-limb self-care activities to improve independence in activities of daily living.(10)

Follow Up & Outcome

The patient was followed for a total duration of 12 weeks during structured physiotherapy rehabilitation, with assessments conducted at baseline (week 0), mid-intervention (week 6), and post-intervention (week 12). Table 2 shows the variation of clinical parameters.

Functional Outcome was the Patient-Specific Functional Scale (PSFS), (12) significant improvements were noted in activities such as eating, holding a glass, dressing, and writing.

Table 2. Clinical outcomes at baseline, 6 weeks, and 12 weeks following structured physiotherapy.

RESULTS				
Parameters		**0 WEEKS**	**6 WEEKS**	**12 WEEKS**
Pain	Wong-Baker FACES Pain Rating Scale	6/10	3/10	0/10
Active Elbow ROM-	Flexion	15°-60°	8°-85°	0°-110°
	Extension	Lag of 15°	Lag of 8°	Full extension (0°)
Passive Elbow ROM	Flexion	10°- 90°	5°- 100°	0°-115°
	Extension	Limited to 10°	Limited to 5°	Full extension (0°)
MMT-Elbow	Flexors	Grade 3	Grade 4-	Grade 4+
	Extensors	Grade 3-	Grade 3+	Grade 4
Functional Outcome	PSFS	3	5	8
ROM: Range of Motion; MMT: Manual Muscle Testing; PSFS: Patient-Specific Functional Scale.				

DISCUSSION

Patient demonstrates functional recovery through a structured, phase-wise rehabilitation. The patient progressed from alimited functional state to almost normal upper limb function during the course of a 12-week intervention session. ROM and muscle strength gradually increased, and the pain subsided.

Maitland-based joint mobilisation techniques have been shown toincrease ROMand reduce pain in joints.(8) A study comparing PNF stretching with static stretching showed that structured exercise programs combined with specialised stretching techniques improved independence and ROM.(4)A systematic reviewrevealed that the most effective interventions are ROM exercises, strengthening exercises, and task-specific functional training.(13)These findings support the idea that muscle function and power can be restored with incremental strengthening, even if its onset is delayed. The integration of activities that the patient needs for independenceis based on the principles of task-oriented training, which is well established in rehabilitation literature.(10) A study showed that functional task training shows better improvements in daily activities. Including these activities in rehabilitation may improve various neuroplastic mechanisms, such as cortical reorganisation and motor learning.(14)

Whether postponed rehabilitation is a hindrance to recovery is an important subject. The literature provides a complex picture. Although early mobilisation is recommended, studies indicate that significant improvement in ROM and functional independence can be achievedeven with delayed commencement.(11,15,16)According to a study, although early interventionmay be better than later intervention, the absolute difference in functional outcomes was small.(17) These results imply that, despite the difficulties associated with delayed rehabilitation, considerable functional improvement is still possible.The presence of cerebral palsy and intellectual disability added complexity to this case. Although it isdifficult to correct motor deficiencies, task-oriented therapies can result in improvements (5,10)This implies that, with the appropriate management, neurological comorbidities may not totally rule out the potential of recovery. This is a single case report without long-term follow-up beyond 12 weeks, andradiological reassessment was not available during physiotherapy evaluation; however, this case highlights several important clinical principles that should be prioritised in practice. First, temporal variables alone should not be used to minimise recovery prospects, and second, Clinical decision-making should be guided by baseline functional evaluation and response to initial intervention rather than prognostication based only on time since injury.

Most crucial is proactive identification and early engagement of at-risk populations in long-term care settings. This patient was identified through a physiotherapy outreach program. Patients with chronic immobility or post-operative complications in residential care facilities are particularly vulnerable to being disregarded and denied access to rehabilitation services that could significantly improve their quality of life and functional independence. Therefore, healthcare systems should set up systematic mechanisms to identify these patients.

Conflict of Interest

The authors declare no conflict of interest.

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Ethical Approval

Ethical approval was not required for this case report in accordance with institutional guidelines.

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