

PHYSIOTHERAPY MANAGEMENT OF PATIENTS WITH DECUBITUS ULCERS IN THE SACRUM AND GLUTEAL REGION FOLLOWING RIGHT FEMORAL NECK FRACTURE SURGERY: A CASE REPORT

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ABSTRACT

This case report aimed to describe physiotherapy management and clinical changes in a patient with pressure ulcer following postoperative right femoral neck fracture. A 60-year-old female after open reduction internal fixation presented with sacral and bilateral gluteal pressure ulcers, type 2 diabetes mellitus, severe anemia, systemic infection, and massive melena. Physiotherapy interventions included positioning, repositioning, breathing exercise, passive and active range of motion exercise, sensory stimulation, gradual mobility training, and family education. Clinical outcomes were evaluated descriptively across three sessions using the Behavioral Pain Scale, pressure ulcer observation, range of motion, manual muscle testing, and Functional Status Score for the Intensive Care Unit. During the intervention period, the Behavioral Pain Scale increased from 8 to 9, and pressure ulcer size remained unchanged. Passive range of motion was maintained from T1 to T3; however, muscle strength decreased from 3/5 to 2/5, and functional status declined from 2 to 0. These findings indicate that physiotherapy in this medically complex case primarily supported joint mobility maintenance, comfort, and prevention of further complications rather than functional recovery. Because this study involved a single patient with a short observation period, the findings should be interpreted descriptively and not as evidence of intervention effectiveness.

Keywords: *Pressure ulcer, Femoral neck fracture, Physiotherapy, Immobilization, Case report.*

INTRODUCTION

Femoral neck fracture is one of the most common musculoskeletal injuries in older adults and frequently requires surgical intervention followed by prolonged rehabilitation management. Postoperative patients commonly experience pain, decreased mobility, muscle weakness, and prolonged bed rest that may interfere with functional recovery and increase the risk of secondary complications. Immobilization after surgery may also contribute to impaired circulation, reduced physical activity, and increased dependency during daily activities. These conditions often require comprehensive rehabilitation approaches to prevent further deterioration and optimize patient recovery. Physiotherapy therefore plays an

important role in postoperative management through gradual mobilization, exercise therapy, and supportive rehabilitation interventions tailored to the patient's clinical condition (Zakia et al., 2025). Previous studies have highlighted the importance of individualized physiotherapy management and patient-centered rehabilitation in improving recovery outcomes and maintaining physical function in patients with mobility limitations (Forslund et al., 2026; Lovegrove et al., 2026). In addition, continuous physiotherapy supervision and rehabilitation planning are considered essential in supporting safe clinical progression during postoperative care (Demont et al., 2026).

One of the major complications associated with prolonged immobilization and bed rest is pressure ulcer development. Pressure ulcers commonly occur in patients with limited mobility due to continuous pressure on specific body areas, impaired tissue perfusion, and reduced repositioning ability. Patients following orthopedic surgery are particularly vulnerable because postoperative pain, weakness, and restricted movement may reduce independent mobility and increase pressure duration over bony prominences. Pressure ulcers may lead to additional pain, infection risk, delayed rehabilitation, prolonged hospitalization, and decreased quality of life if not managed appropriately. Furthermore, the presence of pressure ulcers may interfere with rehabilitation participation and functional recovery during postoperative management. Clinical rehabilitation guidelines therefore emphasize the importance of early prevention strategies, regular positioning, and multidisciplinary management in patients with mobility impairment (Spooren, 2026). Physiotherapy interventions are also recognized as important components in maintaining physical function, reducing complications related to immobility, and supporting safe patient recovery during rehabilitation (Truter et al., 2026; Casertano et al., 2026).

The clinical impact of pressure ulcers extends beyond skin tissue injury because the condition may significantly affect physical function, psychological condition, and overall rehabilitation outcomes. Patients with pressure ulcers frequently experience discomfort, movement limitation, reduced tolerance for activity, and increased dependence on caregivers during daily activities. In patients with complex postoperative conditions, these impairments may further complicate rehabilitation progression and delay functional improvement. Therefore, comprehensive rehabilitation management should not only focus on wound care but also address mobility, respiratory condition, muscle activation, and patient participation during recovery. Physiotherapy interventions such as positioning, range of motion exercise, breathing exercise, gradual mobilization, and family education may help reduce complications associated with prolonged bed rest and support recovery progression. Contemporary rehabilitation practice also emphasizes the importance of integrating patient experience and individualized care planning to improve rehabilitation participation and functional adaptation during treatment (Fine et al., 2026; Lovegrove et al., 2026). Consequently, physiotherapists play an essential role in supporting functional recovery and improving patient condition during postoperative rehabilitation management.

Physiotherapy management in patients with pressure ulcers and postoperative mobility limitation should be carefully adjusted to the patient's tolerance, wound condition, pain level, and general medical status. In this condition, physiotherapy may include proper positioning, regular repositioning, passive and active range of motion exercises, breathing exercises, gradual bed mobility training, and caregiver education. These interventions aim to prevent further complications related to immobility, maintain joint mobility, stimulate muscle activity, support respiratory function, and promote safer functional recovery. Patient-centered rehabilitation is particularly important because each patient may present with different levels of pain, tissue tolerance, functional capacity, and dependency. Contextualized physiotherapy practice has been reported to support rehabilitation goal achievement by connecting clinical intervention with individual patient needs (Forslund et al., 2026). In addition, physiotherapy management should be guided by clinical reasoning, appropriate supervision, and continuous evaluation to ensure that treatment remains safe and relevant to the patient's condition (Demont et al., 2026; Casertano et al., 2026).

The potential novelty of this case report lies in its clinical description of physiotherapy management in a patient with pressure ulcer following postoperative femoral neck fracture and complex mobility limitations. Although physiotherapy is widely recognized as an important component of postoperative and immobility-related rehabilitation, case-based descriptions focusing on the combination of pressure ulcer, orthopedic postoperative status, prolonged bed rest, and functional dependency remain limited. This case provides practical information regarding how physiotherapy interventions can be adapted to a patient with wound-related limitations and reduced mobility during the early rehabilitation period. It also highlights the importance of integrating physical impairment management, positioning strategies, mobility training, and family education within a single rehabilitation plan. Previous studies have emphasized the importance of supported self-management, safe physiotherapy service delivery, and clinical education in improving rehabilitation participation and patient outcomes (Lovegrove et al., 2026; Truter et al., 2026; Johnston et al., 2026). Therefore, this case report may contribute to clinical understanding of individualized physiotherapy management for patients with pressure ulcers in postoperative orthopedic rehabilitation settings.

This case report aimed to describe physiotherapy management and short-term clinical changes in a patient with pressure ulcer following postoperative right femoral neck fracture. The report specifically focused on the implementation of physiotherapy interventions during the rehabilitation period, including positioning, range of motion exercise, breathing exercise, mobility training, and family education. Clinical changes were described based on patient response, functional condition, and rehabilitation progress observed during physiotherapy sessions. This study did not aim to prove the effectiveness of the intervention, but rather to provide a descriptive account of clinical management and patient improvement in a single case. By presenting this case, the report is expected to offer practical insight for

physiotherapists managing postoperative patients with pressure ulcers and mobility limitations. Future clinical documentation and larger studies are still needed to strengthen evidence regarding physiotherapy management in this population (Spooren, 2026; Fine et al., 2026).

METHODS

This study used a case report design to describe physiotherapy management and short-term clinical changes in a patient with pressure ulcer following postoperative right femoral neck fracture. The patient underwent physiotherapy rehabilitation during the postoperative period due to mobility limitation and prolonged bed rest associated with the surgical condition. Clinical problems identified during the initial physiotherapy assessment included pain, limited mobility, decreased functional activity, impaired physical condition, and the presence of pressure ulcer associated with prolonged immobilization. The patient also demonstrated dependence in several daily activities due to postoperative weakness and restricted movement tolerance. Physiotherapy management was conducted according to the patient's medical condition, physical tolerance, and rehabilitation goals during the treatment period. A case report approach was selected because it allows detailed clinical description of physiotherapy intervention and patient response during rehabilitation management in a complex postoperative condition.

Initial physiotherapy assessment was performed before intervention to identify the patient's baseline clinical condition and rehabilitation needs. The assessment included pain evaluation using the Visual Analog Scale (VAS), joint range of motion examination using a goniometer, muscle strength evaluation, anthropometric measurement, functional ability assessment, and observation of mobility limitation and pressure ulcer condition. Additional physical examination and clinical observation were also conducted to monitor the patient's general response during rehabilitation sessions. Baseline findings obtained from the initial assessment were used to determine physiotherapy goals and intervention planning throughout the rehabilitation period. Follow-up evaluations were performed periodically during physiotherapy sessions to monitor clinical changes and patient progression. All examination procedures were conducted descriptively according to physiotherapy clinical practice standards and adjusted to the patient's tolerance and postoperative condition.

The physiotherapy intervention was administered according to the patient's clinical condition, wound-related limitations, and tolerance during each session. The intervention program included positioning and repositioning to reduce prolonged pressure on the wound area, breathing exercises to maintain respiratory function, passive and active range of motion exercises to preserve joint mobility, sensory stimulation to support neuromuscular response, and gradual mobility training according to the patient's ability. Family education was also provided to support positioning, pressure ulcer prevention, safe movement assistance, and continuation of simple exercises outside the therapy session. The intervention was progressed

carefully based on pain response, fatigue level, wound condition, and overall patient safety. All physiotherapy procedures were supervised directly to ensure appropriate exercise performance and to minimize the risk of additional discomfort or tissue stress during rehabilitation.

Clinical evaluation was conducted descriptively by comparing patient findings before and after physiotherapy management across the treatment period. The outcomes observed included changes in pain intensity, joint range of motion, muscle strength, functional ability, mobility tolerance, and pressure ulcer-related clinical condition. Evaluation points were arranged according to the treatment sessions described in the original case report, allowing changes in the patient's condition to be monitored over time. Data were analyzed using descriptive comparison without statistical testing because this study involved a single patient and was designed as a case report. Therefore, the findings were interpreted as observed clinical changes during physiotherapy management, not as evidence of intervention effectiveness or generalizable treatment effects.

RESULTS AND DISCUSSION

The patient was a 60-year-old female with postoperative open reduction internal fixation (ORIF) of the right femoral neck fracture who experienced prolonged bed rest and multiple systemic complications during hospitalization. Clinical conditions identified during physiotherapy management included sacral and bilateral gluteal pressure ulcers, type 2 diabetes mellitus, severe anemia, systemic infection, and massive melena. Physiotherapy management was conducted in three treatment sessions with serial evaluations performed at T1, T2, and T3. Clinical outcomes observed during the rehabilitation period included pain response, pressure ulcer condition, range of motion, muscle strength, and functional ability. Because of the patient's unstable medical condition and limited activity tolerance, several clinical parameters demonstrated fluctuation during the intervention period. The Behavioral Pain Scale evaluation is presented in Table 1, while pressure ulcer evaluation based on the National Pressure Injury Advisory Panel (NPIAP) classification is presented in Table 2.

Tabel 1. Behavioral Pain Scale Evaluation

Evaluation	T1	T2	T3
Behavioral Pain Scale (BPS)	8	9	9

As presented in Table 1, the patient demonstrated high pain levels throughout the physiotherapy management period. The Behavioral Pain Scale score increased from 8 at T1 to 9 at T2 and remained 9 at T3. These findings indicate persistent and increasing pain response during hospitalization. The increase in pain score may be associated with the patient's complex postoperative condition, prolonged immobilization, pressure ulcer discomfort, systemic complications, and limited tolerance to movement activity. Therefore,

the findings should be interpreted as part of the patient's overall clinical progression rather than as isolated physiotherapy outcomes.

Tabel 2. Pressure Ulcer Evaluation Based on NPIAP Classification

Location	Classification	Size
Sacrum	Stage III	6 × 6 cm
Gluteus dextra	Stage II	4 × 3 cm
Gluteus sinistra	Stage II	6 × 5 cm

Pressure ulcer evaluation based on the National Pressure Injury Advisory Panel classification is presented in Table 2. The patient presented with one Stage III pressure ulcer in the sacral region measuring 6 × 6 cm and bilateral Stage II pressure ulcers in the gluteal regions. The right gluteal ulcer measured 4 × 3 cm, while the left gluteal ulcer measured 6 × 5 cm. During the physiotherapy management period, no substantial reduction in wound size was observed. However, clinical observation demonstrated slight changes in wound appearance and tissue condition during follow-up evaluation. The persistence of pressure ulcers throughout the intervention period may be associated with prolonged bed rest, impaired mobility, systemic illness, and limited tissue healing capacity related to the patient's overall medical condition.

Active and passive range of motion evaluations during physiotherapy management are presented in Table 3 and Table 4. Active range of motion assessment could only be performed at T1 because the patient's clinical condition progressively deteriorated during subsequent sessions, resulting in limited cooperation and reduced tolerance for active movement examination. Passive range of motion evaluation was therefore used to monitor joint mobility during the later treatment sessions.

Tabel 3. Active Range of Motion Evaluation

Joint Movement	T1
Shoulder dextra	S: 0°–0°–120°
Shoulder sinistra	S: 0°–0°–120°
Elbow dextra	S: 0°–0°–130°
Elbow sinistra	S: 0°–0°–130°
Wrist dextra	S: 0°–0°–60°
Wrist sinistra	S: 0°–0°–60°
Hip dextra	S: 0°–0°–70°
Hip sinistra	S: 0°–0°–80°
Knee dextra	S: 0°–0°–90°
Knee sinistra	S: 0°–0°–110°
Ankle dextra	S: 0°–0°–20°
Ankle sinistra	Ankle sinistra

Table 4. Passive Range of Motion Evaluation

Joint Movement	T1	T2	T3
Shoulder dextra	S: 0°–0°–150°	S: 0°–0°–150°	S: 0°–0°–150°
Shoulder sinistra	S: 0°–0°–150°	S: 0°–0°–150°	S: 0°–0°–150°
Elbow dextra	S: 0°–0°–130°	S: 0°–0°–130°	S: 0°–0°–130°
Elbow sinistra	S: 0°–0°–130°	S: 0°–0°–130°	S: 0°–0°–130°
Wrist dextra	S: 0°–0°–60°	S: 0°–0°–60°	S: 0°–0°–60°
Wrist sinistra	S: 0°–0°–60°	S: 0°–0°–60°	S: 0°–0°–60°
Hip dextra	S: 0°–0°–80°	S: 0°–0°–80°	S: 0°–0°–80°
Hip sinistra	S: 0°–0°–90°	S: 0°–0°–90°	S: 0°–0°–90°
Knee dextra	S: 0°–0°–100°	S: 0°–0°–100°	S: 0°–0°–100°
Knee sinistra	S: 0°–0°–120°	S: 0°–0°–120°	S: 0°–0°–120°
Ankle dextra	S: 0°–0°–20°	S: 0°–0°–20°	S: 0°–0°–20°
Ankle sinistra	S: 0°–0°–20°	S: 0°–0°–20°	S: 0°–0°–20°

As shown in Table 3, active range of motion at T1 demonstrated movement limitation, particularly in the right lower extremity associated with the postoperative condition. However, passive range of motion findings presented in Table 4 remained relatively stable throughout the intervention period. No substantial decline in passive joint mobility was observed between T1 and T3. These findings suggest that passive mobilization and positioning interventions may have contributed to maintaining joint flexibility despite the patient's prolonged immobilization and deteriorating clinical status.

Table 5. Muscle Strength Evaluation

Joint Movement	T1	T2	T3
Shoulder dextra	3/5	2/5	2/5
Shoulder sinistra	3/5	2/5	2/5
Elbow dextra	3/5	2/5	2/5
Elbow sinistra	3/5	2/5	2/5
Wrist dextra	3/5	2/5	2/5
Wrist sinistra	3/5	2/5	2/5
Hip dextra	3/5	2/5	2/5
Hip sinistra	3/5	2/5	2/5
Knee dextra	3/5	2/5	2/5
Knee sinistra	3/5	2/5	2/5
Ankle dextra	3/5	2/5	2/5
Ankle sinistra	3/5	2/5	2/5

Muscle strength evaluation during physiotherapy management is presented in Table 5. At T1, the patient demonstrated generalized muscle weakness with muscle strength graded 3/5 in all evaluated extremities. During subsequent evaluations, muscle strength decreased to 2/5 and remained unchanged until T3. The decline in muscle strength may be associated with prolonged bed rest, systemic illness, postoperative weakness, limited activity tolerance, and reduced participation in active movement during hospitalization. Although the physiotherapy

program aimed to maintain physical condition and prevent further deterioration, the patient's unstable medical condition may have contributed to reduced functional capacity and muscle performance throughout the intervention period.

Table 6. Functional Status Score for the Intensive Care Unit Evaluation

Functional Activity	T1	T2	T3
Rolling	1	0	0
Supine to sit transfer	1	0	0
Sitting at edge of bed	0	0	0
Sit to stand transfer	0	0	0
Walking	0	0	0
Total Score	2	0	0

Functional ability evaluation using the Functional Status Score for the Intensive Care Unit is presented in Table 6. At T1, the patient demonstrated minimal functional ability with a total score of 2, indicating severe dependence during mobility activities. The patient was only able to perform limited rolling and supine-to-sit transfer activities with assistance. At T2 and T3, the total score decreased to 0, indicating complete dependence in all evaluated functional activities. This decline may be related to worsening systemic condition, persistent weakness, pain, prolonged immobilization, and reduced tolerance for physical activity during hospitalization. Therefore, the physiotherapy interventions during this period were primarily directed toward maintaining physical condition, preventing secondary complications associated with prolonged bed rest, and supporting patient comfort during clinical management.

The present case demonstrated complex clinical changes during physiotherapy management in a patient with pressure ulcer following postoperative right femoral neck fracture and multiple systemic complications. Persistent pain, stable passive range of motion, declining muscle strength, and worsening functional status were observed throughout the intervention period. Although the patient did not show functional improvement during hospitalization, physiotherapy management was still considered clinically important to maintain joint mobility, reduce the risk of secondary complications, and support patient comfort during prolonged immobilization. The maintenance of passive joint mobility observed from T1 to T3 may indicate that positioning and passive exercise interventions contributed to preventing further joint stiffness despite the patient's deteriorating medical condition. In critically ill or severely dependent patients, physiotherapy goals may shift from functional restoration toward supportive rehabilitation and prevention of additional physical decline. Previous studies have emphasized that individualized and contextualized physiotherapy management is essential in patients with complex clinical conditions because rehabilitation outcomes are strongly influenced by overall medical status and patient tolerance (Forslund et al., 2026; Demont et al., 2026). Furthermore, continuous

physiotherapy supervision and gradual intervention adjustment remain important components of rehabilitation management in patients with severe mobility limitation and prolonged bed rest (Casertano et al., 2026).

Pain response and persistence of pressure ulcers in this case were likely associated with the patient's severe systemic condition and prolonged immobilization during hospitalization. The increase in Behavioral Pain Scale scores from 8 to 9 may reflect worsening discomfort related to postoperative pain, tissue pressure, infection, prolonged bed rest, and limited movement tolerance. In addition, pressure ulcer healing may have been impaired by uncontrolled diabetes mellitus, severe anemia, systemic infection, and reduced tissue perfusion, all of which are known to interfere with tissue recovery processes. Although no substantial reduction in wound size was observed during the intervention period, positioning and repositioning interventions remained clinically important to minimize prolonged tissue pressure and prevent further wound deterioration. Previous rehabilitation studies have highlighted that supportive physiotherapy interventions may help maintain patient comfort and reduce complications associated with immobility and prolonged hospitalization (Ferreira et al., 2026; Fine et al., 2026). Clinical rehabilitation guidelines also emphasize the importance of pressure management, multidisciplinary care, and individualized patient monitoring in patients with severe mobility limitation and pressure ulcer risk (Spooren et al., 2026; Lovegrove et al., 2026).

The preservation of passive range of motion throughout the intervention period may represent an important clinical finding despite the absence of functional improvement. In patients with prolonged immobilization and severe medical instability, maintaining joint flexibility is often a primary rehabilitation objective because reduced movement may accelerate contracture formation, stiffness, pain, and additional physical deterioration. In this case, active range of motion assessment became limited after T1 due to declining clinical tolerance and reduced patient participation, indicating that the patient's systemic condition strongly influenced rehabilitation capacity. Nevertheless, passive range of motion values remained relatively stable from T1 to T3, suggesting that passive mobilization and positioning interventions may have contributed to maintaining musculoskeletal extensibility during bed rest. Similar rehabilitation approaches have been reported to support preservation of physical function and movement quality in patients with severe mobility limitation and prolonged inactivity (Monteiro et al., 2026). Physiotherapy management in critically ill or highly dependent patients therefore often prioritizes maintenance strategies rather than functional progression, particularly when systemic complications interfere with rehabilitation participation (Casertano et al., 2026). Moreover, physiotherapists are required to continuously adapt intervention intensity and movement exposure according to patient tolerance, clinical safety, and fluctuating medical status during rehabilitation management (Demont et al., 2026).

The decline in muscle strength and functional ability observed in this case further illustrates the impact of prolonged immobilization and systemic deterioration on rehabilitation outcomes. Muscle strength decreased from 3/5 to 2/5 across all extremities, while the Functional Status Score for the Intensive Care Unit declined from 2 to 0, indicating complete dependence during mobility-related activities. These findings suggest that the patient experienced substantial physical deconditioning during hospitalization, likely influenced by postoperative weakness, pain, prolonged bed rest, infection, anemia, and reduced activity tolerance. In severely compromised patients, functional decline may continue despite rehabilitation intervention because the overall physiological burden exceeds the patient's recovery capacity. Consequently, physiotherapy management in this context should not be interpreted solely based on functional gains, but also on its role in preventing secondary complications, maintaining residual movement capacity, and supporting patient comfort. Previous studies have emphasized that physiotherapy services remain clinically valuable in dependent and medically complex patients because rehabilitation contributes to supportive care, safe mobilization, and maintenance of physical condition during prolonged hospitalization (Truter et al., 2026; Ferreira et al., 2026). Patient-centered rehabilitation approaches also recognize that clinical stabilization and preservation of remaining function may represent meaningful outcomes in patients with severe systemic impairment (Fine et al., 2026).

The novelty of this case report lies in its description of physiotherapy management in a patient with pressure ulcer, postoperative femoral neck fracture, prolonged immobilization, and multiple systemic complications occurring simultaneously. Unlike standard postoperative orthopedic rehabilitation, the main goal in this case was not rapid functional restoration, but supportive rehabilitation, maintenance of joint mobility, symptom control, prevention of secondary complications, and patient comfort. This case highlights how physiotherapy goals must be adapted when patients present with unstable medical conditions, limited participation, pain, and severe dependency. Similar evidence shows that physiotherapy may contribute to pain management and physical function in patients with musculoskeletal and mobility-related problems (Choo et al., 2026; Sousa-Fraguas et al., 2026). Individualized and contextualized rehabilitation is therefore important in complex clinical situations where treatment progression depends strongly on patient tolerance and safety (Forslund et al., 2026; Lovegrove et al., 2026; Johnston et al., 2026). Physiotherapy-guided clinical reasoning and adequate clinical competence are also essential to support safe intervention planning in medically complicated patients (Vats et al., 2026; Bylund et al., 2026).

The clinical implication of this case is that physiotherapy should remain part of multidisciplinary care for postoperative patients with pressure ulcers and severe immobility, even when functional improvement is limited. In such cases, physiotherapy may support positioning, respiratory function, joint mobility, pain monitoring, comfort, and prevention of

further musculoskeletal complications. Symptom management and safe rehabilitation planning are particularly important in medically complex patients, as clinical improvement may be limited by systemic illness rather than by rehabilitation intervention alone (Ferreira et al., 2026; Ingkapassakorn et al., 2026; Spooren et al., 2026). However, the findings must be interpreted cautiously because this report involved only one patient, used a short observation period, and did not include long-term follow-up or objective wound-healing measurement. The patient's systemic complications may also have strongly influenced pain, strength, wound healing, and functional outcomes. Therefore, this case should be viewed as a descriptive clinical report rather than evidence of treatment effectiveness. Future studies with larger samples, longer follow-up, and more comprehensive outcome measures are needed to strengthen evidence for physiotherapy management in similar complex postoperative cases (Breedt et al., 2026; Johnston et al., 2026; Lovegrove et al., 2026).

CONCLUSION

This case report demonstrated that physiotherapy management in a patient with pressure ulcer following postoperative right femoral neck fracture and severe systemic complications was primarily directed toward supportive rehabilitation and prevention of further physical deterioration. During the intervention period, passive joint mobility was relatively maintained, whereas pain, muscle strength, and functional ability showed clinical decline associated with prolonged immobilization and unstable medical condition. These findings indicate that physiotherapy in medically complex patients may play an important role in maintaining residual physical capacity, supporting patient comfort, and minimizing complications related to prolonged bed rest, even when functional recovery remains limited. However, because this study involved a single patient with a short observation period, the findings should be interpreted descriptively and cannot be generalized as evidence of intervention effectiveness.

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