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Multimodal Physical Rehabilitation in the Recovery Period After Total Hip Endoprosthesis

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Abstract To access the clinical effectiveness of comprehensive, stage-based rehabilitation programs following total hip replacement (THR), particularly in patients with comminuted subcapital femoral neck fractures and other hip joint pathologies. **Methods:** 126 patients (30-65 years, mean 48) underwent THR using Zimmer (88%) or Mur-CITO (12%) prostheses. A structured rehabilitation program was divided into preoperative, early, late and long-term recovery stages. Outcomes measured included range of motion, pain (VAS), use of walking aids, muscle tone and return to work. **Results:** 6 months postoperatively, 98% of patients under 50 years of age and 83% aged 51–60 years were able to walk without assistance. Flexion/extension improved from 68 to 92.3, and VAS scores dropped from 8.2 to 1.5. Few complications occurred. **Conclusion:** Early and individualized rehabilitation significantly improved physical function and quality of life after THR.

Keywords Rehabilitation, Hip arthroplasty, Endoprothesis, Physiotherapy, Postoperative recovery

1. Introduction

The global burden of musculoskeletal diseases has escalated, contributing to long term disability and reduced quality of life, particularly among elderly people.

Osteoarthritis, the leading subtype of which is coxarthrosis, accounts for a significant proportion of these conditions.

In advanced stages, total hip replacement (THR) is the standard intervention to alleviate pain and restore mobility. However, the postoperative period poses significant challenges, including muscle atrophy, joint stiffness, and proprioceptive deficits. Given these complications, early and structured rehabilitation plays a pivotal role in recovery [2-3]. This study focuses on evaluating the outcomes of a comprehensive rehabilitation protocol applied to patients following THR.

2. Materials and Methods

The study included 126 patients aged 30 to 65 years (mean age: 48 years) who underwent total hip replacement surgery. Of these, 111 patients (88%) received Zimmer prostheses, while 15 patients (12%) were fitted with Mur-CITO prosthetic systems.

The group consisted of 49 women (38%) and 77 men (61.2%). Among the participants, 74 patients (58.7%) were diagnosed with stage III coxarthrisis, 21 patients (16.7%) with avascular necrosis of the femoral head, 30 patients (23.8%) with subcapital femoral neck fractures and one patient (0.8%) with an old central dislocation of the femur.

Bilateral hip replacement was performed in eight patients, and cemented hip implantation was carried out in four cases (three with a CPT stem and one hybrid). One patient received a revision stem. Cement-less acetabular components (Trilogy) and femoral stems (ET) were used. The Mur-CITO monopolar prosthesis was implanted in 15 elderly patients who were considered at high-risk for anesthesia or had significant comorbidities. All surgeries were performed under multicomponent combined anesthesia at the Department of Adult Orthopedics of the Samarkand Branch of the Republican Specialized Scientific-Practical Medical Center of Traumatology and Orthopedics. Postoperatively, autologous blood was transfused via drainage.

Special attention was given to the prevention of complications that may arise hip joint arthroplasty, particularly deep vein thrombosis.

Accordingly, all patients were prescribed low-molecular-weight heparins and Fraxiparine based on our recommendations. These anticoagulant agents are effective in reducing blood viscosity and the risk of thrombosus formation.

In addition, to prevent the progression of osteoporosis of any etiology, all patients are prescribed Osteogenon, vitamin D3, and osteochondroprotective agents rich in macro- and microelements, such as Calcemin. These agents play a crucial role in maintaining maintaining bone mineral density

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and restoring metabolic balance.

Epidemiological indicators and clinical observations show that all patients undergoing hip replacement surgery require continuous, targeted and individualized rehabilitation. This once again highlights the importance of rehabilitation measures to ensure full physical recovery. However, our analytical and scientific investigations revealed that existing data sources and systematic methodological frameworks are insufficient. Therefore, to achieve higher efficiency in modern medicine and rehabilitation, we conducted research aimed at developing an optimal rehabilitation system encompassing all postoperative recovery stages.

Within this approach, the key objective was to develop scientifically based, clinically effective and patient-specific approaches to rehabilitation.

Thus, the rehabilitation process of these patients is an integral part of a comprehensive and integrative approach aimed at optimizing recovery, reducing rehabilitation time and improving the quality of life after surgery.

Based on these considerations, the Research Institute of Rehabilitation and Sports Medicine at the Samarkand State Medical University set a goal of address this issue by facilitating the fastest possible restoration of patient's health.

Rehabilitation measures were categorized as local (focused on limb recovery) and general somatic. To enhance the effectiveness of the rehabilitation process, the entire period was divided into several stages. The preoperative stage, including preparatory measures, lasted 3-5 days. This was followed by the early recovery stage, lasting 1 to 12 days post-surgery. The next phase, the late stage of recovery, lasted from 2 to 3 months after the operation. Long-term recovery was considered to last from 6 to 12 months. This structured, step-by-step approach enabled the development of systematic and goal-oriented rehabilitation interventions.

Throughout the long-term rehabilitation phase, particular attention was placed on enhancing motor coordination by incorporating an extended range of therapeutic exercises, massage, electrical stimulation, and general somatic biostimulation techniques.

The effectiveness of the rehabilitation program was assessed using a set of clinical and functional criteria. Firstly, the range of motion (including flexion/extension and abduction/adduction) was measured at different pre- and postoperative stages. Secondly, pain intensity was evaluated using the Visual Analog Scale (VAS). Thirdly, progress was tracked in terms of the patients' ability to discontinue the use of walking aids. Fourthly, the recovery of normal muscle tone in the limbs and the reduction of venous-lymphatic stasis in distal segments were examined. Lastly, the potential for patients aged 30 to 60 years to return to work was evaluated.

A key strength of this rehabilitation program is its structured, timely, and phased implementation, which resulted in positive outcomes for the majority of patients. This approach allows for the evaluation of treatment effectiveness not only in the early postoperative phase but also throughout the long-term recovery process.

3. Results and Discussion

Postoperative observations following total hip arthroplasty demonstrated that 123 out of 126 patients (97.6%) showed a marked improvement in quality of life, thereby confirming the effectiveness of the implemented rehabilitation measures. Only one case (0.8%) did not yield the expected outcome and was classified as an isolated incident in the overall analysis: a 77-year-old patient who passed away on the 14th postoperative day due to a pulmonary embolism.

Dislocation of the prosthetic femoral head occurred in 5 cases (4.0%) and was attributed to several factors. In one case involving a 77-year-old patient, postoperative psychosis led to a joint dislocation, necessitating open reduction and the implantation of a Mur-CITO prosthesis. Another dislocation occurred in a patient with grade 2–3 obesity, who slipped at home in the bathroom; this was managed successfully with closed reduction. Two additional cases were linked to non-compliance with orthopedic protocols-patients walked without crutches, excessively flexed the joint, and performed external rotations-resulting in dislocations that were both treated with closed reduction. In a fifth case, dislocation occurred 1.5 months postoperatively and was also managed through closed reduction. Owing to the presence of a flexion-adduction contracture of the hip, an adductotomy and resection of the rectus femoris muscle were performed, followed by a three-week course of skeletal traction from the anterior inferior iliac spine.

Following these interventions, no further dislocations were observed among the study participants, and the rehabilitation process proceeded with a stable and consistent recovery.

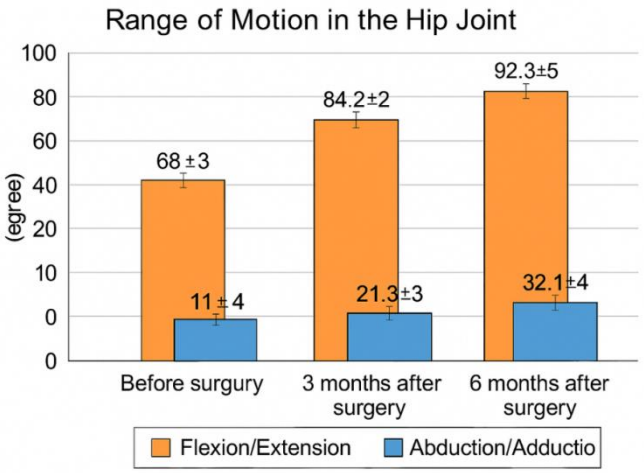

Figure 1. Dynamics of hip joint range of motion before surgery and at different stages of recovery ($p < 0.05$)

A single case (0.8%) of purulent complications was observed, attributed to allergic dermatitis caused by plaster tape. A detailed assessment of rehabilitation outcomes was conducted in a subset of 62 patients. Preoperatively, average hip joint mobility was limited, with flexion/extension measuring 68 ± 3 degrees and abduction/adduction at 11 ± 4 degrees. By three months postoperatively (late recovery stage), average flexion/extension had improved to 84.2 ± 20 degrees, and

abduction/adduction to 21 ± 30 degrees. At six months, further progress was noted, with flexion/extension reaching 92.3 ± 50 degrees and abduction/adduction increasing to 32.1 ± 4 degrees, clearly indicating the effectiveness of the rehabilitation measures (Fig. 1).

In patients over the age of 70, postoperative dislocations were observed between the 5th and 7th weeks following surgery, particularly among those who experienced complications during the early recovery phase. Rehabilitation protocols for this age group frequently lacked specific exercises aimed at increasing hip flexion beyond 85 degrees. Hospital records show that postoperative mobilization with crutches generally occurred between days 3 and 7, with men demonstrating earlier activity levels.

Prior to surgery, 91% of patients reported severe pain in the hip and groin regions, both at rest and during movement. Following surgery, 88% (59 patients) experienced a reduction in pain during passive joint movements, and by the long-term recovery stage, 91% (61 patients) reported pain-free mobility. Nevertheless, many older patients continued to suffer from lower back pain, often linked to underlying conditions such as osteochondrosis, spondylosis, and osteoporosis.

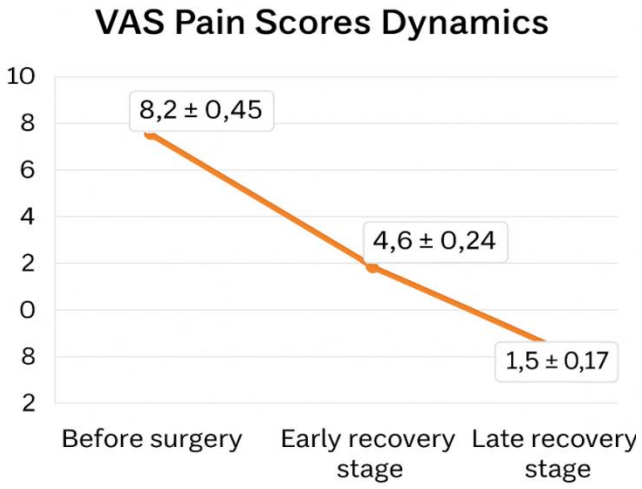

Figure 2. VAS (Visual Analog Scale) pain scores dynamics ($p<0.05$)

In addition to quantitative analysis, the dynamics of pain syndrome were assessed using the VAS a 10 cm line on which patients independently indicate the intensity of their pain and satisfaction with therapy. Before surgery, the average pain intensity measured by the Visual Analog Scale (VAS) was 8.2 ± 0.45. In the early postoperative period, this value decreased significantly to 4.6 ± 0.24, and by the late recovery phase, it had further declined to 1.5 ± 0.17, reflecting a marked reduction in pain and highlighting the effectiveness of the rehabilitation interventions (Fig. 2).

The overall effectiveness of the comprehensive rehabilitation program was evidenced by an average functional improvement of 3.1 points between the early and late recovery stages. Prior to surgery, the majority of patients depended on assistive walking devices: 82% used a cane, 6% relied on bilateral crutches, 8% used a single crutch, and only 4% were able to walk unaided.

By the third month of recovery, 73% of patients under the age of 50 were walking independently without aids, a figure that increased to 98% by the sixth month. Among those aged 51–60, 54% achieved independent walking at three months, rising to 83% at six months. In contrast, among patients over 61 years old, only 2% had discontinued assistive devices by three months, with this proportion increasing modestly to 14% by six months (Table 1).

Table 1. Discontinuation of walking aids by age group after surgery

Postoperative Period	*Under 50*	*51–60*	*Over 61*
3 months	73%	54%	2%
6 months	98%	83%	14%

Satisfactory restoration of muscle tone and a significant reduction in venous-lymphatic stasis in the distal limbs were observed in 98% of patients between the 8th and 11th weeks following surgery. Among patients of working age (30–60 years), the majority were able to return to their jobs within 5-6 months postoperatively, indicating both the success of the rehabilitation program and the adequacy of functional recovery.

These findings emphasize the critical role of a personalized rehabilitation strategy in achieving favorable outcomes after total hip replacement (THR). The high percentage of patients regaining independent mobility and returning to work further demonstrates the effectiveness of a structured, multistage approach [8-9]. Zimmer prostheses showed particularly stable functional results, while monopolar Mur-CITO implants proved to be suitable alternatives for elderly or high-risk patients.

Our rehabilitation model-focused on early mobilization, effective pain management, and targeted muscle recovery-is consistent with current evidence supporting accelerated recovery strategies to shorten rehabilitation time and improve quality of life. Nevertheless, ongoing research is essential to refine rehabilitation protocols for specific patient subgroups and further enhance clinical outcomes [10].

4. Conclusions

The study demonstrated that the application of modern prosthetic systems-particularly the Zimmer design-provides high clinical and functional outcomes in patients undergoing total hip replacement. Although monopolar prostheses present certain limitations, they remain a viable and effective option for elderly patients with comorbidities and complex fractures, contributing to the preservation of mobility.

Additionally, an individualized approach to postoperative physical therapy and the selection of therapeutic exercises plays a crucial role in promoting early mobilization. This personalized strategy significantly enhances the overall effectiveness of the rehabilitation process, supporting faster recovery and improved long-term results.

Conflict of Interest

The authors declare no conflict of interest.

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