E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/16.02.811

Research Article

# Relationship between Time to Surgery and Functional Outcome in Hip Fractures among Older Adults

**Dr. Md Kamran Alam[1], Dr. Shashi Kumar[2], Dr Rahul Ranjan[3]**
[1]Senior Resident, Darbhanga Medical College & Hospital, Laheriasarai, Darbhanga, Bihar.
[2]Senior Resident, Darbhanga Medical College & Hospital, Laheriasarai, Darbhanga, Bihar.
[3]Assistant professor, Darbhanga Medical College & Hospital, Laheriasarai, Darbhanga, Bihar.
Received: 02.08.26, Revised: 12.08.26, Accepted: 26.08.26

**ABSTRACT**
**Background:** Hip fractures among older adults are associated with substantial morbidity, functional disability, and prolonged hospitalization. Surgical timing may influence postoperative recovery and complications.
**Aim:** To evaluate the relationship between time to surgery and functional outcomes among older adults with hip fractures.
**Materials and Methods:** This prospective comparative observational study included 110 patients aged ≥60 years with hip fractures requiring surgical intervention. Patients were categorized into early surgery (≤48 hours, n=55) and delayed surgery (>48 hours, n=55) groups. Functional outcomes were assessed using the Harris Hip Score (HHS) at 6 weeks, 3 months, and 6 months. Postoperative mobility, hospitalization duration, and complications were also evaluated.
**Results:** Mean admission-to-surgery intervals were 30.6 ± 9.4 and 79.8 ± 24.6 hours in the early and delayed surgery groups, respectively. Early surgery was associated with higher HHS at 6 weeks (68.4 ± 8.6 vs. 59.6 ± 9.2), 3 months (82.4 ± 7.8 vs. 73.2 ± 8.4), and 6 months (88.2 ± 6.9 vs. 80.1 ± 7.6). Excellent or good functional outcomes were achieved in 83.6% versus 54.5% of patients. Independent ambulation (76.4% vs. 54.5%) and return to prefracture mobility (74.5% vs. 52.7%) were more frequent following early surgery. Total hospitalization was shorter (7.5 ± 2.3 vs. 10.7 ± 3.2 days), with fewer postoperative complications.
**Conclusion:** Early hip fracture surgery within 48 hours was associated with better functional recovery, improved mobility, shorter hospitalization, and fewer complications. Timely surgical intervention should be prioritized alongside appropriate medical optimization.

**Keywords:** Hip Fracture, Early Surgery, Delayed Surgery, Harris Hip Score, Functional Outcome, Older Adults, Postoperative Mobility.

## INTRODUCTION

Hip fractures represent a major public health concern among older adults and are associated with substantial morbidity, mortality, functional impairment, and healthcare expenditure. With increasing life expectancy and the growing prevalence of osteoporosis, the global burden of hip fractures continues to rise[1]. These injuries commonly occur following low-energy falls and frequently result in loss of mobility, prolonged hospitalization, reduced independence, and deterioration in quality of life. Despite advances in surgical techniques, anaesthesia, and rehabilitation, hip fractures remain associated with considerable postoperative complications and long-term disability [1,2].Timely surgical management is considered an essential component of hip fracture care. Early surgical intervention facilitates fracture stabilization, reduces the duration of immobilization, and allows earlier mobilization and rehabilitation. Conversely, prolonged preoperative waiting periods may increase the risk of complications such as pressure ulcers, pneumonia, venous thromboembolism, urinary tract infections, and functional decline. Surgical delays may occur because of medical optimization, anticoagulant use, limited operating theatre availability, delayed referrals, or institutional constraints [3,4].Several clinical guidelines recommend performing hip fracture surgery as early as medically feasible, generally within 24–48 hours of admission. The National Institute for Health and Care Excellence recommends surgery on the day of admission or the following day, while other international guidelines emphasize avoiding unnecessary delays beyond 48 hours. However, determining the optimal timing remains challenging because patients frequently present with multiple comorbidities requiring preoperative stabilization [5,6].Previous studies have investigated the association between surgical timing and postoperative mortality, complications, and

hospitalization. Simunovic et al. demonstrated that earlier surgery was associated with reduced mortality and fewer postoperative complications, particularly pneumonia and pressure sores. Similarly, Moja et al. reported that surgery within 48 hours was associated with improved survival outcomes compared with delayed intervention [7,8].Although the relationship between surgical delay and mortality has been extensively investigated, its influence on postoperative functional recovery remains less clearly established. Functional recovery following hip fracture is influenced by several factors, including age, prefracture mobility, comorbidities, fracture type, surgical technique, nutritional status, and rehabilitation intensity. Delayed surgical intervention may contribute to muscle weakness, prolonged bed rest, and reduced mobility, potentially compromising functional recovery even after successful fracture fixation [9,10].Studies evaluating early and delayed surgery have reported conflicting findings regarding postoperative mobility and functional independence. Some investigators have demonstrated improved functional recovery and shorter hospitalization following early surgery, whereas others have reported comparable long-term functional outcomes after adjustment for baseline clinical characteristics. These variations may be attributable to differences in study populations, definitions of surgical delay, methods of functional assessment, and duration of follow-up [11–13].The Harris Hip Score (HHS) is a commonly used clinical assessment tool for evaluating pain, function, deformity, and range of motion following hip surgery. It provides a quantitative measure of postoperative hip function and is useful for assessing functional recovery at different follow-up intervals. Evaluation of the relationship between surgical timing and HHS may therefore provide clinically relevant information for optimizing hip fracture management among older adults [14,15].Therefore, the present study was designed to evaluate the relationship between time to surgery and postoperative functional outcomes among older adults with hip fractures, comparing patients undergoing early surgery within 48 hours of admission with those undergoing delayed surgery after 48 hours.

## MATERIALS AND METHODS

### Study design and setting

This prospective comparative observational study was designed to evaluate the relationship between surgical timing and postoperative functional outcomes in older adults with hip fractures treated at a tertiary care.A total of 110 patients aged 60 years or older with hip fractures requiring operative management were included in the study cohort.Patients were divided into two groups according to the interval between hospital admission and surgery:

- Group A – Early surgery: Surgery performed within 48 hours of admission (n = 55).
- Group B – Delayed surgery: Surgery performed more than 48 hours after admission (n = 55).

### Inclusion Criteria

Patients aged 60 years or older presenting with radiologically confirmed femoral neck, intertrochanteric, or subtrochanteric fractures following low-energy trauma, undergoing operative management, and providing consent for follow-up were eligible for inclusion.

### Exclusion Criteria

Patients with pathological fractures, polytrauma, periprosthetic fractures, previous ipsilateral hip surgery, severe pre-existing neurological disorders affecting ambulation, or inability to complete functional assessment were excluded.

### Preoperative Assessment

All patients underwent clinical evaluation, routine laboratory investigations, and radiological assessment. Demographic characteristics, comorbidities, fracture classification, mechanism of injury, and prefracture ambulatory status were documented. The time of hospital admission and initiation of surgery were recorded to determine the admission-to-surgery interval.Patients requiring medical stabilization underwent appropriate optimization before surgery. Reasons for delay were recorded, including uncontrolled comorbidities, anticoagulant-related concerns, anaesthetic clearance, and operating theatre availability.

### Surgical Management

Patients underwent appropriate operative management according to fracture type, bone quality, and clinical condition. Femoral neck fractures were managed using hemiarthroplasty or internal fixation when indicated, whereas intertrochanteric and subtrochanteric fractures were treated using suitable fixation techniques, including proximal femoral nailing or dynamic hip screw fixation.

**Postoperative Management and Rehabilitation**

All patients received postoperative analgesia, thromboprophylaxis according to institutional protocols, and physiotherapy. Early mobilization and weight-bearing were encouraged according to fracture stability, fixation technique, and patient tolerance. Rehabilitation included bed exercises, assisted ambulation, progressive strengthening, and gait training.

**Outcome Assessment**

The primary outcome was functional recovery at six months, assessed using the Harris Hip Score (0–100), with higher scores indicating better hip function.Secondary outcomes included HHS at 6 weeks and 3 months, postoperative mobility, length of hospital stay, and postoperative complications such as pneumonia, pressure ulcers, deep vein thrombosis, surgical site infection, and mortality.

**Statistical Analysis**

Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics.21. Continuous variables were summarized as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. The Shapiro–Wilk test was used to assess normality. Independent-samples t-tests or Mann–Whitney U tests were used for continuous variables, and Chi-square or Fisher's exact tests for categorical variables. Repeated-measures analysis was planned to evaluate changes in functional scores over time. Multivariable linear regression was recommended to assess the independent association between surgical timing and six-month HHS after adjustment for age, sex, fracture type, comorbidities, prefracture mobility, and surgical procedure. Statistical significance was defined as $p<0.05$.

**RESULTS**

A total of 110 patients with hip fractures were included in the study, with 55 patients each in the early surgery and delayed surgery groups. As shown in Table 1, the mean age was 72.4 ± 7.8 years in the early surgery group and 74.1 ± 8.2 years in the delayed surgery group. Females constituted 56.4% and 60.0% of the respective groups. Intertrochanteric fractures were the most common fracture type in both groups (54.5% vs. 50.9%), followed by femoral neck fractures (36.4% vs. 40.0%). Hypertension was present in 45.5% and 52.7% of patients, while diabetes mellitus was observed in 32.7% and 38.2%, respectively. Prefracture independent ambulation was reported in 78.2% of the early surgery group and 72.7% of the delayed surgery group.

As presented in Table 2, the mean admission-to-surgery interval was considerably shorter in the early surgery group (30.6 ± 9.4 hours) compared with the delayed surgery group (79.8 ± 24.6 hours). The early surgery group also had a shorter postoperative hospital stay (6.2 ± 2.1 vs. 7.4 ± 2.6 days) and total hospital stay (7.5 ± 2.3 vs. 10.7 ± 3.2 days). Mobilization within 48 hours after surgery was achieved in 78.2% of patients undergoing early surgery compared with 58.2% in the delayed surgery group.The comparison of Harris Hip Scores (HHS) during follow-up is presented in Table 3 and Figure 1. Patients undergoing early surgery demonstrated higher mean HHS at all follow-up intervals. At six weeks, the mean HHS was 68.4 ± 8.6 in the early surgery group compared with 59.6 ± 9.2 in the delayed surgery group. At three months, the corresponding scores were 82.4 ± 7.8 and 73.2 ± 8.4. By six months, the early surgery group achieved a mean HHS of 88.2 ± 6.9 compared with 80.1 ± 7.6 in the delayed surgery group, indicating better functional recovery among patients undergoing earlier surgical intervention.The distribution of functional outcome categories at six months is summarized in Table 4 and Figure 2. Excellent functional outcomes (HHS 90–100) were observed in 41.8% of patients in the early surgery group compared with 18.2% in the delayed surgery group. Good outcomes were recorded in 41.8% and 36.4%, respectively. Conversely, fair outcomes were more frequent in the delayed surgery group (30.9% vs. 12.7%), as were poor outcomes (14.5% vs. 3.6%). Overall, excellent or good functional outcomes (HHS ≥80) were achieved in 83.6% of patients undergoing early surgery compared with 54.5% undergoing delayed surgery.Postoperative mobility and functional independence at six months are presented in Table 5 and Figure 3. Independent ambulation was achieved in 76.4% of patients in the early surgery group compared with 54.5% in the delayed surgery group. Walking aids were required by 20.0% and 36.4% of patients, respectively, while 3.6% and 9.1% remained nonambulatory. Independent performance of activities of daily living was reported in 70.9% of patients undergoing early surgery compared with 50.9% undergoing delayed surgery.

Furthermore, return to prefracture mobility was observed in 74.5% and 52.7% of patients, respectively, demonstrating more favorable mobility outcomes following early surgery.The distribution of postoperative complications is presented in Table 6. Complications were generally more frequent in the delayed surgery group. Pneumonia occurred in 5.5% of patients undergoing early surgery compared with 12.7% undergoing delayed surgery, while urinary tract infections were reported in 7.3% and 14.5%, respectively. Pressure ulcers occurred in 3.6% and 10.9% of patients. Deep vein thrombosis was not observed in the early surgery group but occurred in 7.3% of the delayed surgery group. Surgical site infections were recorded in 3.6% and 5.5%, while delirium occurred in 7.3% and 14.5%, respectively. Six-month mortality was 3.6% in the early surgery group compared with 7.3% in the delayed surgery group.

Table 1. Comparison of Baseline Demographic and Clinical Characteristics (N = 110)

| Parameter | Early surgery (n = 55) | Delayed surgery (n = 55) |
|---|---|---|
| Age (years), mean ± SD | 72.4 ± 7.8 | 74.1 ± 8.2 |
| Male | 24 (43.6%) | 22 (40.0%) |
| Female | 31 (56.4%) | 33 (60.0%) |
| Femoral neck fracture | 20 (36.4%) | 22 (40.0%) |
| Intertrochanteric fracture | 30 (54.5%) | 28 (50.9%) |
| Subtrochanteric fracture | 5 (9.1%) | 5 (9.1%) |
| Hypertension | 25 (45.5%) | 29 (52.7%) |
| Diabetes mellitus | 18 (32.7%) | 21 (38.2%) |
| Prefracture independent ambulation | 43 (78.2%) | 40 (72.7%) |

Table 2. Comparison of Surgical Timing and Hospitalization

| Parameter | Early surgery (n = 55) | Delayed surgery (n = 55) |
|---|---|---|
| Admission-to-surgery interval (hours) | 30.6 ± 9.4 | 79.8 ± 24.6 |
| Postoperative hospital stay (days) | 6.2 ± 2.1 | 7.4 ± 2.6 |
| Total hospital stay (days) | 7.5 ± 2.3 | 10.7 ± 3.2 |
| Mobilization within 48 hours after surgery | 43 (78.2%) | 32 (58.2%) |

Table 3. Comparison of Harris Hip Scores During Follow-up

| Follow-up | Early surgery (n = 55) | Delayed surgery (n = 55) |
|---|---|---|
| 6 weeks | 68.4 ± 8.6 | 59.6 ± 9.2 |
| 3 months | 82.4 ± 7.8 | 73.2 ± 8.4 |
| 6 months | 88.2 ± 6.9 | 80.1 ± 7.6 |

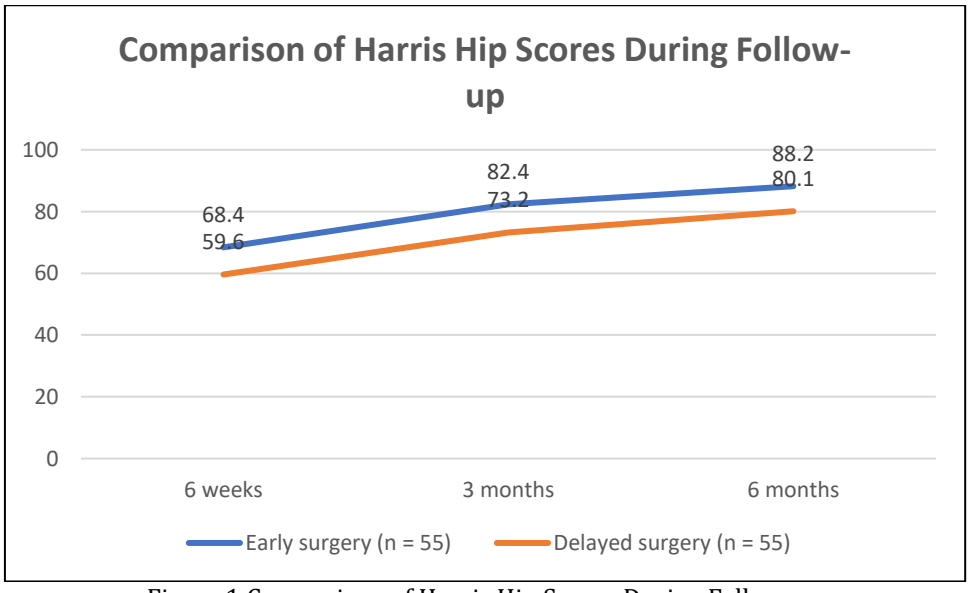



Figure 1 Comparison of Harris Hip Scores During Follow-up

Table 4. Comparison of Functional Outcome Categories at Six Months

| Harris Hip Score category | Early surgery (n = 55) | Delayed surgery (n = 55) |
|---|---|---|
| Excellent (90–100) | 23 (41.8%) | 10 (18.2%) |
| Good (80–89) | 23 (41.8%) | 20 (36.4%) |
| Fair (70–79) | 7 (12.7%) | 17 (30.9%) |
| Poor (<70) | 2 (3.6%) | 8 (14.5%) |
| Excellent or good (≥80) | 46 (83.6%) | 30 (54.5%) |

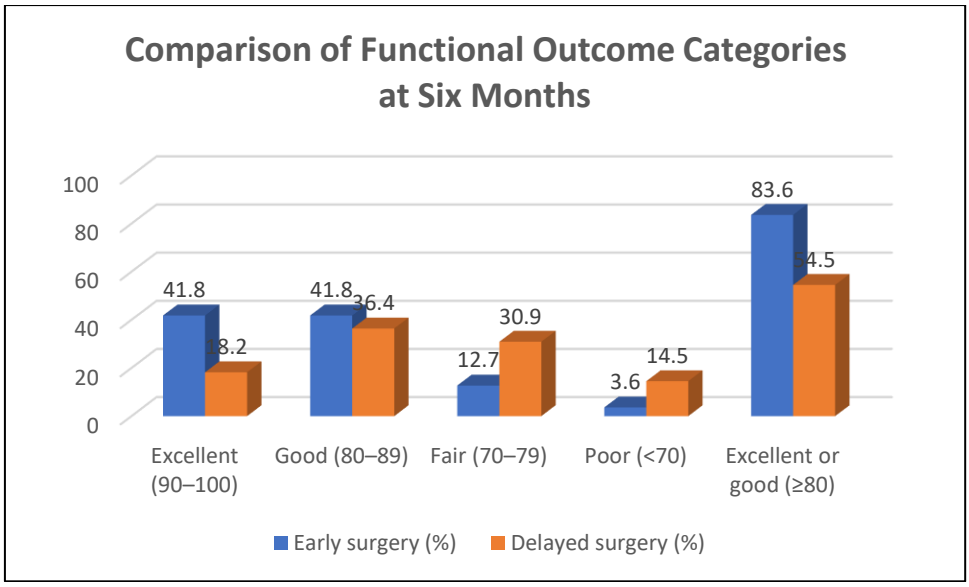



Figure 2 Comparison of Functional Outcome Categories at Six Months

Table 5. Comparison of Postoperative Mobility and Functional Independence at Six Months

| Outcome | Early surgery (n = 55) | Delayed surgery (n = 55) |
|---|---|---|
| Independent ambulation | 42 (76.4%) | 30 (54.5%) |
| Ambulation with walking aid | 11 (20.0%) | 20 (36.4%) |
| Nonambulatory | 2 (3.6%) | 5 (9.1%) |
| Independent activities of daily living | 39 (70.9%) | 28 (50.9%) |
| Return to prefracture mobility | 41 (74.5%) | 29 (52.7%) |

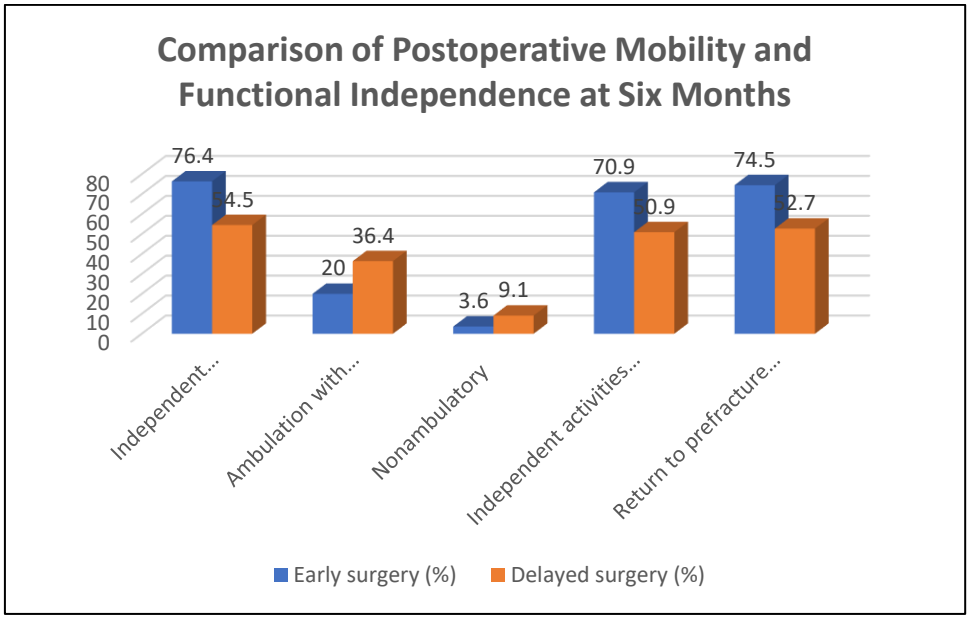



Figure 3 Comparison of Postoperative Mobility and Functional Independence at Six Months

Table 6. Comparison of Postoperative Complications

| Complication | Early surgery (n = 55) | Delayed surgery (n = 55) |
|---|---|---|
| Pneumonia | 3 (5.5%) | 7 (12.7%) |
| Urinary tract infection | 4 (7.3%) | 8 (14.5%) |
| Pressure ulcer | 2 (3.6%) | 6 (10.9%) |
| Deep vein thrombosis | 0 (0.0%) | 4 (7.3%) |
| Surgical site infection | 2 (3.6%) | 3 (5.5%) |
| Delirium | 4 (7.3%) | 8 (14.5%) |
| Mortality within six months | 2 (3.6%) | 4 (7.3%) |

## DISCUSSION

Hip fractures among older adults are associated with substantial functional impairment, prolonged hospitalization, postoperative complications, and increased mortality. The timing of surgical intervention is considered an important potentially modifiable factor influencing postoperative recovery. The present study compared functional outcomes between patients undergoing early surgery within 48 hours of admission and those undergoing delayed surgery after 48 hours. The results demonstrated better functional recovery, improved mobility, shorter hospitalization, and fewer postoperative complications in the early surgery group.In the present study, the mean age was 72.4 ± 7.8 years in the early surgery group and 74.1 ± 8.2 years in the delayed surgery group, with a predominance of female patients. This demographic distribution is consistent with the epidemiological characteristics of hip fractures among older adults. Khan et al. (2009) [1], in a systematic review of 52 studies involving 291,413 patients, highlighted the considerable burden of hip fractures and the importance of timely surgical intervention. Their findings indicated that earlier surgery was associated with reduced hospital stay, although the effects on other outcomes varied between studies. The mean admission-to-surgery interval in the present study was 30.6 ± 9.4 hours in the early surgery group compared with 79.8 ± 24.6 hours in the delayed surgery group. Total hospitalization was shorter among patients undergoing early surgery (7.5 ± 2.3 versus 10.7 ± 3.2 days). These findings are consistent with Orosz et al. (2004) [2], who conducted a prospective cohort study involving 1,206 patients and reported that earlier surgery was associated with reduced hospital stay and fewer days of severe pain. However, they did not demonstrate a significant improvement in mortality or locomotor function, emphasizing that the relationship between surgical timing and recovery may be influenced by baseline clinical characteristics. Functional recovery was the principal outcome evaluated in the present study. At six weeks, the mean Harris Hip Score was 68.4 ± 8.6 in the early surgery group compared with 59.6 ± 9.2 in the delayed surgery group. This difference persisted at three months (82.4 ± 7.8 versus 73.2 ± 8.4) and six months (88.2 ± 6.9 versus 80.1 ± 7.6). These findings suggest that earlier surgery may facilitate improved functional recovery by reducing preoperative immobilization and enabling earlier rehabilitation. Simunovic et al. (2010) [3], in a systematic review and meta-analysis, demonstrated that earlier surgical intervention was associated with reduced mortality and postoperative complications, supporting the importance of avoiding unnecessary surgical delays. Moja et al. (2012) [4] conducted a meta-analysis involving 191,873 patients from 35 studies and reported that surgery within 48 hours was associated with significantly lower mortality (pooled OR 0.74, 95% CI 0.67–0.81) and fewer pressure ulcers (OR 0.48, 95% CI 0.38–0.60). These findings are consistent with the present complication profile, in which pressure ulcers occurred in 3.6% of patients undergoing early surgery compared with 10.9% undergoing delayed surgery. The reduction in immobilization time may explain the lower frequency of pressure-related complications among patients receiving earlier surgical treatment.

At six months, excellent or good functional outcomes were achieved in 83.6% of patients undergoing early surgery compared with 54.5% in the delayed surgery group. Independent ambulation was observed in 76.4% and 54.5% of patients, respectively. These findings suggest a possible association between early surgery and improved postoperative independence. However, the observational study by Orosz et al. [2] did not identify a significant improvement in locomotion with earlier surgery, indicating that functional benefits may not be consistent across all patient populations. This discrepancy may reflect differences in prefracture mobility,

frailty, comorbidities, rehabilitation protocols, and methods of functional assessment.Pincus et al. (2017) [5], in a large retrospective cohort study involving 42,230 patients, demonstrated that surgical waiting times exceeding 24 hours were associated with increased 30-day mortality and medical complications. Following propensity-score matching, mortality was 6.5% among patients undergoing surgery after 24 hours compared with 5.8% among those treated earlier. These findings reinforce the importance of minimizing avoidable surgical delays, particularly among medically stable patients. In the present study, postoperative pneumonia occurred in 5.5% of patients in the early surgery group compared with 12.7% in the delayed surgery group, while deep vein thrombosis was recorded in 0.0% and 7.3%, respectively. Shiga et al. (2008) [6], in a systematic review and meta-analysis, investigated the relationship between operative delay and mortality among patients with hip fractures and identified an association between delayed surgery and increased mortality. Similarly, Grimes et al. (2002) [7] evaluated the effects of surgical timing on morbidity and mortality, highlighting the importance of accounting for underlying medical illness when interpreting the consequences of surgical delay. The HIP ATTACK Investigators (2020) [8] conducted an international randomized controlled trial comparing accelerated surgery with standard care in patients with hip fractures. The trial did not demonstrate a significant reduction in its primary outcomes of mortality or major complications with accelerated surgery, despite some improvements in secondary outcomes. These findings indicate that although unnecessary delays should be avoided, operating within an extremely short time frame may not necessarily improve all clinical outcomes when compared with timely standard care. The American Academy of Orthopaedic Surgeons (2021) [9] recommends considering hip fracture surgery within 24–48 hours of admission because this may be associated with better outcomes. Similarly, the National Institute for Health and Care Excellence (NICE) [10] recommends performing surgery on the day of admission or the following day, while promptly addressing correctable comorbidities. These recommendations support the importance of organized multidisciplinary care to facilitate timely surgery without compromising medical optimization. Surgical procedure selection may also influence postoperative functional outcomes. Rogmark and Johnell (2006) [11], in a meta-analysis of 14 randomized studies involving 2,289 patients with displaced femoral neck fractures, reported fewer major complications and reoperations following primary arthroplasty compared with internal fixation. These findings emphasize that the relationship between surgical timing and functional recovery should be evaluated alongside fracture type and operative procedure, as these factors may independently affect postoperative function. The Harris Hip Score used in the present study was originally described by Harris (1969) [12] and remains a widely employed instrument for assessing hip pain, functional ability, deformity, and range of motion. The progressive improvement observed in both study groups indicates postoperative functional recovery, while the higher scores in the early surgery group suggest a possible beneficial association between shorter surgical waiting time and subsequent hip function. Nevertheless, the Harris Hip Score should be interpreted in conjunction with prefracture mobility, functional independence, and other patient-reported outcomes. More recent evidence also supports the clinical importance of timely surgical intervention. Mazarello Paes et al. (2026) [13], in a systematic review involving 139 studies and more than 4.3 million patients, reported that surgery within 48 hours was associated with improved mobility, functional status, and several clinical outcomes. The authors also emphasized substantial heterogeneity in definitions of surgical timing and the need for standardized reporting. A systematic review of clinical practice guidelines published in 2026 [14] identified broad agreement that hip fracture surgery should generally be performed within 24–48 hours, while emphasizing early analgesia, appropriate perioperative care, and rehabilitation. In addition, recent systematic evidence evaluating surgical timing and postoperative complications [15] suggests that delays beyond 24 hours may be associated with increased adverse outcomes, although findings depend on the timing threshold and study design.

## CONCLUSION

Early surgical intervention within 48 hours of admission may be associated with improved functional recovery, better postoperative mobility, and shorter hospitalization among older adults with hip fractures. In the dataset, six-month Harris Hip Scores were higher in the

early surgery group (88.2 ± 6.9 versus 80.1 ± 7.6), and return to prefracture mobility was more frequent (74.5% versus 52.7%). These findings support the clinical importance of minimizing avoidable surgical delays while ensuring appropriate preoperative medical optimization, but they require confirmation using actual patient data.

**Limitations**

The proposed observational study has a relatively small sample size and a six-month follow-up period. Differences in baseline frailty, comorbidities, fracture patterns, surgical procedures, and reasons for surgical delay may confound the relationship between surgical timing and functional outcomes.

## REFERENCES


1. Khan SK, Kalra S, Khanna A, Thiruvengada MM, Parker MJ. Timing of surgery for hip fractures: a systematic review of 52 published studies involving 291,413 patients. Injury. 2009;40(7):692-697.
2. Orosz GM, Magaziner J, Hannan EL, Morrison RS, Koval K, Gilbert M, et al. Association of timing of surgery for hip fracture and patient outcomes. JAMA. 2004;291(14):1738-1743.
3. Simunovic N, Devereaux PJ, Sprague S, Guyatt GH, Schemitsch E, Debeer J, et al. Effect of early surgery after hip fracture on mortality and complications: systematic review and meta-analysis. CMAJ. 2010;182(15):1609-1616.
4. Moja L, Piatti A, Pecoraro V, Ricci C, Virgili G, Salanti G, et al. Timing matters in hip fracture surgery: patients operated within 48 hours have better outcomes. A meta-analysis and meta-regression of over 190,000 patients. PLoS One. 2012;7(10):e46175.
5. Pincus D, Ravi B, Wasserstein D, Huang A, Paterson JM, Nathens AB, et al. Association between wait time and 30-day mortality in adults undergoing hip fracture surgery. JAMA. 2017;318(20):1994-2003.
6. Shiga T, Wajima Z, Ohe Y. Is operative delay associated with increased mortality of hip fracture patients? Systematic review, meta-analysis, and meta-regression. Can J Anaesth. 2008;55(3):146-154.
7. Grimes JP, Gregory PM, Noveck H, Butler MS, Carson JL. The effects of time-to-surgery on mortality and morbidity in patients following hip fracture. Am J Med. 2002;112(9):702-709.
8. HIP ATTACK Investigators. Accelerated surgery versus standard care in hip fracture (HIP ATTACK): an international, randomised, controlled trial. Lancet. 2020;395(10225):698-708.
9. American Academy of Orthopaedic Surgeons. Management of hip fractures in older adults: evidence-based clinical practice guideline. Rosemont (IL): American Academy of Orthopaedic Surgeons; 2021.
10. National Institute for Health and Care Excellence. Hip fracture: management. Clinical guideline CG124. London: NICE; 2011. Updated 2023.
11. Rogmark C, Johnell O. Primary arthroplasty is better than internal fixation of displaced femoral neck fractures: a meta-analysis of 14 randomized studies with 2,289 patients. Acta Orthop. 2006;77(3):359-367.
12. Harris WH. Traumatic arthritis of the hip after dislocation and acetabular fractures: treatment by mold arthroplasty. An end-result study using a new method of result evaluation. J Bone Joint Surg Am. 1969;51(4):737-755.
13. Mazarello Paes V, Ting A, Paes MVI, Masters J, Graham SM, Costa ML, et al. What is the association between time to surgery and patient outcome after hip fracture? A systematic review. Bone Joint J. 2026;108-B(1):30-38.
14. Shutes TK, Johnson KN, Blevins EW, Shipley MG, Mehta SP. Clinical practice guideline recommendations for orthopedic surgical management of traumatic hip fractures: a systematic review. J Trauma Inj. 2026;39(2):110-118.
15. Yan W, Wang H, Li Z, Jiang T, Li J, Jiang C. Timing of surgery in patients with hip fracture: a systematic review with meta-analysis and trial sequential analysis (2017–2024). EFORT Open Rev. 2026;11(8):903-912.