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Timing of treatment for fracture neck of femur in elderly patients a short term functional outcome study

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Abstract
Background: Femoral neck fractures are disabling injuries common in the elderly population, often resulting from minor falls. These fractures are frequently operated on and associated with high postoperative fatality rates. The impact of surgical timing on functional outcomes remains unclear, though earlier interventions are suggested to improve prognosis and quality of life.
Aim of the study: to investigate the relation between the time of surgery (Whether early, intermediate or late) and the functional outcome in elderly patients presented with fracture of femoral neck treated by Total hip replacement.
Method: This prospective comparative case series study investigates the relationship between surgical timing and functional outcomes in 25 elderly patients with femoral neck fractures treated by total hip replacement. Patients were divided into three groups based on the time to surgery: Group A (Within 48 hours, n=7), Group B (48 hours to 7 days, n=15), and Group C (>7 days, n=3). Functional outcomes were assessed using the Harris Hip Score (HHS) at 1, 3, and 6 months postoperatively.
Results: At 1 month, no significant difference in HHS was observed between groups (P=0.136). However, at 3 and 6 months, HHS was significantly lower in the >7 days group compared to the other groups (P=0.001). Delayed surgery (>7 days) was also significantly associated with pressure sore development (66.7%, P=0.044). Gender differences were minimal, but males had a significantly higher HHS at 6 months (P=0.029).
Conclusion: The study concludes that early surgical intervention (Within 48 hours) leads to better postoperative mobility, pain relief, and reduced pressure sore incidence. Prompt management of femoral neck fractures is crucial to optimize recovery and quality of life in elderly patients.

Keywords: Femoral neck fracture, surgical timing, total hip replacement, Harris Hip Score (HHS)

Introduction
Hip fractures are common injuries, particularly in the elderly, often resulting from low-energy falls. In younger populations, they are typically associated with athletic activity or high-energy trauma. Immediate diagnosis and management are crucial to prevent joint complications [1]. Femoral neck fractures, a specific type of intracapsular hip fracture, represent a significant healthcare concern due to their impact on health insurance costs and patient outcomes. These fractures occur at the junction between the femoral shaft and head, a location prone to injury due to its structural and vascular characteristics [2, 3]. The economic burden of hip fractures is immense, ranking among the top 20 most expensive diagnoses in the United States, with approximately $20 billion spent annually on their management [4, 5]. Projections indicate that by 2030, there will be an estimated 300,000 hip fracture cases annually in the United States [6]. Lifetime incidences of hip fractures are approximately 1 in 4 for women and 1 in 10 for men, with most occurring within the joint capsule, leading to complications such as avascular necrosis (AVN) due to disrupted blood supply [7]. Understanding hip anatomy is essential for effective management. The hip joint is a synovial joint comprising the acetabulum, femoral head, and neck, with structural elements like the calcar femorale providing support and stress distribution [8]. The femoral neck contains tensile and compressive trabeculae, forming Ward's triangle, a region of low bone density [9]. Ligaments such as the ischiofemoral, iliofemoral, and pubofemoral contribute to hip stability, while muscles like the gluteus medius and iliopsoas support movement [10]. Aging and osteoporosis significantly increase the risk of femoral neck fractures by reducing bone density, strength, and elasticity, making elderly individuals

particularly vulnerable to low-energy injuries [11]. By 2050, the global incidence of hip fractures is projected to rise by 310% in men and 240% in women [12]. Additional risk factors include malnutrition, neuromuscular conditions, and reduced physical activity [13]. Intracapsular fractures typically heal via osteonal reconstruction due to the inability to form external callus. Displaced fractures often compromise the femoral head's blood supply, increasing the risks of non-union and AVN [14]. Early surgical intervention is widely recommended to optimize outcomes, reduce complications, and improve recovery, as supported by guidelines such as those from the National Institute for Health and Care Excellence (NICE) [15]. Despite advancements in surgical techniques, the optimal treatment approach—whether hemiarthroplasty or total hip arthroplasty—remains debated, particularly in active elderly patients with high functional demands [16, 17]. Early mobilization and comprehensive postoperative care are crucial to minimize complications and support functional recovery [18]. Aim of the study: To investigate the relation between the time of surgery (whether early or late) and the functional outcome in elderly patients with femoral neck fracture treated with total hip replacement.

Method

This prospective comparative study included 25 patients with femoral neck fractures treated surgically with total hip replacement between December 2020 and October 2021 at Baghdad Medical City (Ghazzi Alhariri Hospital) and a private hospital. Patients were followed up for six months by the same surgical team. The study was ethically approved, and informed consent was obtained from all participants. Inclusion criteria included patients aged ≥60 years, ambulatory with or without assistive devices, with closed fractures caused by low-energy trauma, and those with comorbidities such as diabetes mellitus. Exclusion criteria included patients aged <60 years, open fractures, pathological fractures, and those treated with modalities other than total hip replacement. Participants had a mean age of 65.44±3.72 years, with 13 males and 12 females. Fractures were classified based on the AO/OTA classification (31B1: 8%, 31B2: 36%, 31B3: 56%). Patients were divided into three groups based on surgical timing: Group A (within 48 hours), Group B (3-7 days), and Group C (>7 days). Data collected included patient demographics, HHS scores at 1, 3, and 6 months postoperatively, fracture type, surgical timing, co-morbidities, BMI, pressure sore development, and length of hospital stay. Preoperative preparation involved routine blood tests, imaging, and prophylactic anticoagulation. Surgical procedures were performed under spinal or general anesthesia using a posterolateral approach. Postoperative care included anticoagulation with low molecular weight heparin, physiotherapy, and follow-up visits at 2 weeks, 1 month, 3 months, and 6 months. HHS parameters such as hip pain, gait, range of motion, and deformity were assessed using standardized tools. Data analysis using IBM SPSS v26 included t-tests, ANOVA, and Fisher's exact test to compare outcomes and correlations. Significant findings included the impact of surgical timing on functional recovery and pressure sore development. The study emphasized the importance of timely surgical intervention and comprehensive postoperative care in improving outcomes for elderly patients with femoral neck fractures.

Results

Age: Mean age was 65.44±3.72 years, with 40.0% under 65 years and 60.0% aged 65 years or older. Gender: The study included 13 males (52.0%) and 12 females (48.0%). BMI: Most patients (80.0%) had a BMI ≥ 25 kg/m², while 20.0% had a BMI < 25 kg/m². Fracture Side: Fractures occurred on the right side in 12 patients (48.0%) and the left side in 13 patients (52.0%). Fracture Classification: Fractures were classified as 31B1 (8.0%), 31B2 (36.0%), and 31B3 (56.0%). Time to Surgery: Surgical intervention was performed within 48 hours in 28.0%, within 3-7 days in 60.0%, and after 7 days in 12.0%. Pressure Sores: Preoperative pressure sores were observed in 3 patients (12.0%), while 22 patients (88.0%) did not develop sores. Harris Hip Score (HHS): The mean HHS improved over time, with scores of 61.12 ± 1.39 at one month, 69.12 ± 2.17 at three months, and 74.47 ± 3.56 at six months. This study highlights the distribution of demographic, clinical, and outcome measures in patients with femoral neck fractures treated by total hip replacement. As show in table 1.

Table 1: Description of the study group (N= 25) characteristics

Freq.			N %
Age group	<65 years	10	40.0%
	≥65 years	15	60.0%
Gender	Female	12	48.0%
	Male	13	52.0%
BMI(kg/m2)	<25	5	20.0%
	≥25	20	80.0%
Fracture side	Right	12	48.0%
	Left	13	52.0%
Fracture classification	31B1	2	8.0%
	31B2	9	36.0%
	31B3	14	56.0%
Duration till operation	Within 48 hrs.	7	28.0%
	within 3-7 days	15	60.0%
	> 7 days	3	12.0%
Pressure sore development	Yes	3	12.0%
	No	22	88.0%

One-month score: there was no significant difference in HHS mean between study groups (60.66 vs 60.05, P= 0.136).

Three months' score: HHS mean was significantly lower in >7 days' interval than 48 hrs and 3-7 days' interval (64.97 vs 71.11 and 69.03, P= 0.001).

Six months' score: HHS mean was significantly lower in >7 days' interval than 48 hrs. and 3-7 days' interval (68.07 vs 74.01 and 77.86, P= 0.001) as in table 2.

Table 2: Distribution of HHS mean according to fracture till operation interval

Duration from fracture till operation							
48 hrs.			3-7 days		> 7 days		P-Value
Mean		±SD	Mean	±SD	Mean	±SD	
One month score	60.66	1.11	61.56	1.51	60.05	0.09	0.136
Three months score	71.11	2.01	69.03	0.80	64.97	0.58	0.001
Six months score	77.86	2.05	74.01	2.29	68.07	0.68	0.001
Significant P value < 0.05							

There was no significant difference in HHS between the three groups, one month after the surgery. But after three months from surgery, HHS was higher in the first group as compared to other two groups, and at six months after surgery, HHS in the first two groups achieved a higher result than third group with a significant P value. As in fig 1.

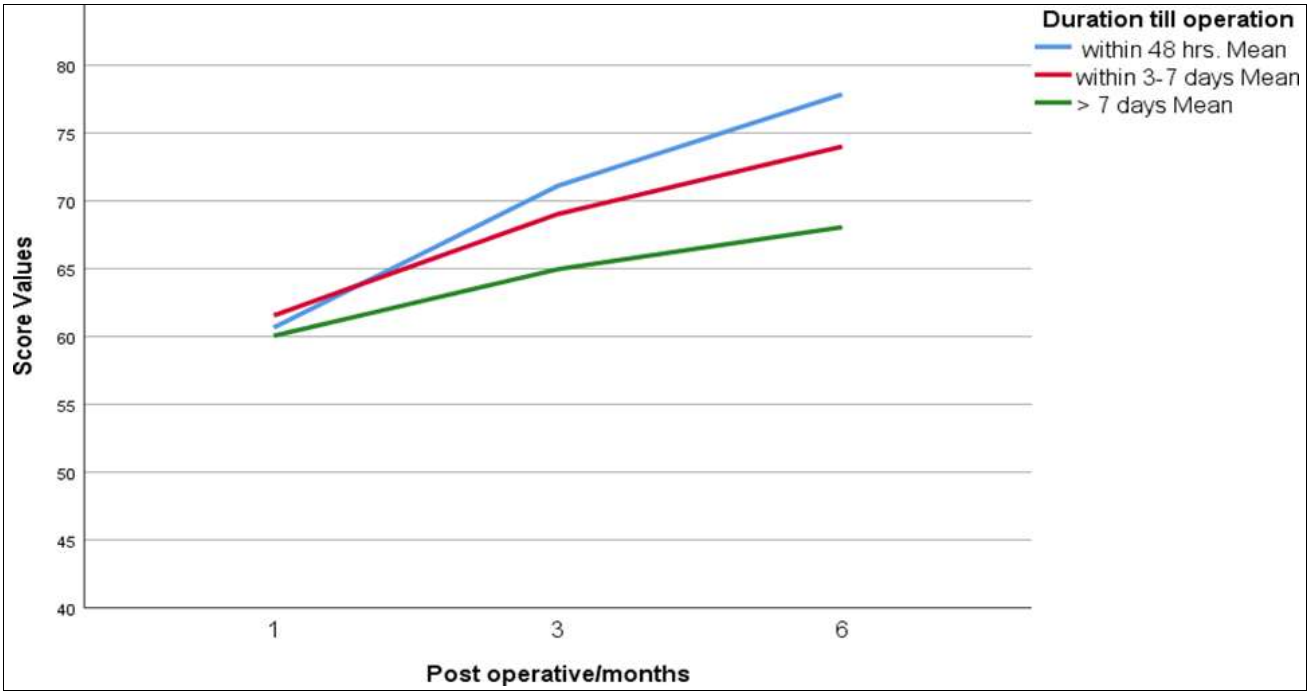

Fig 1: Distribution of HHS according to fracture till operation interval

There was no significant difference in HHS means between different BMI groups. As in table 3.

Table 3: Distribution of HHS according to BMI groups

BMI (kg/m^2)					
<25			≥25		P-Value
Mean		±SD	Mean	±SD	
One month score	60.66	1.31	61.24	1.43	0.418
Three months score	69.10	2.17	69.13	2.23	0.975
Six months score	73.48	3.45	74.60	3.65	0.543
Significant P value < 0.05					

There was no significant difference in HHS means between different Age groups. As in table 4.

Table 4: Distribution of HHS according to Age groups

Age group					
<65 years			≥65 years		P-Value
Mean		±SD	Mean	±SD	
One month score	61.31	1.56	61.00	1.32	0.608
Three months score	69.69	1.32	68.76	2.57	0.306
Six months score	75.61	3.05	73.55	3.74	0.275
Significant P value < 0.05					

There was no significant correlation between HHS 1, 3 and 6 months and Age (R= 0.011, 0.220 and 0.150) respectively. As in fig 2.

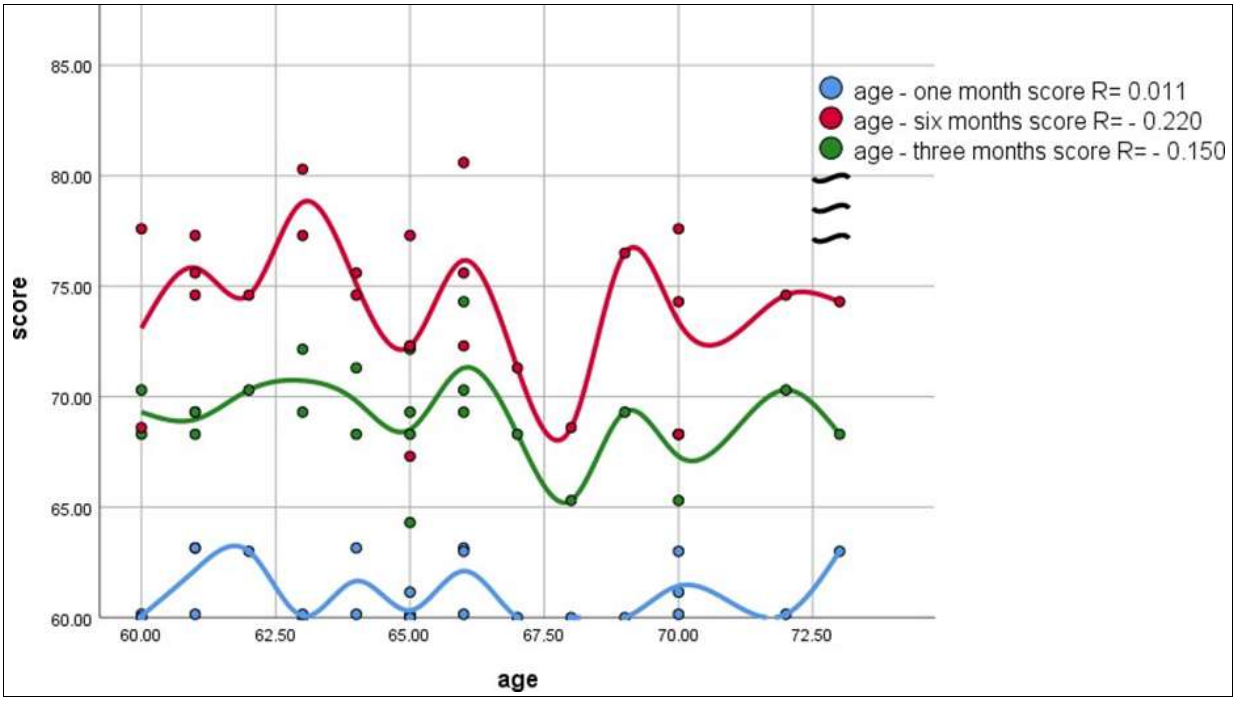

Fig 2: Correlations between HHS and age

One-month score: there was no significant difference in HHS mean between gender groups (61.16 vs 61.09, P= 0.909). Three-month score: there was no significant difference in HHS mean between gender groups (68.79 vs 69.44, P= 0.464). Six months' score: HHS mean was significantly higher in males than females (75.84 vs 72.78, P= 0.029). As in table 5.

Table 5: Distribution of HHS according to Gender

Gender					
Female			Male		P-Value
Mean		±SD	Mean	±SD	
One month score	61.16	1.45	61.09	1.41	0.909
Three months score	68.79	2.26	69.44	2.14	0.464
Six months score	72.78	3.35	75.84	3.21	0.029
Significant P value < 0.05					

More than 7 days' interval was significantly associated with development of pressure sores (66.7%, P=0.044) as a pre-operative finding. As in table 6.

Table 6: Distribution of pressure sore development according to fracture till operation interval

Pressure sore development						
Yes				No		P-Value
Freq.			N %	Freq.	N %	
Fracture till operation interval	Within 48 hrs.	0	0.0%	7	31.8%	0.044
	Within 3-7 days	1	33.3%	14	63.6%	
	> 7 days	2	66.7%	1	4.5%	
Significant P value < 0.05						

Discussion

Femoral neck fractures represent a significant challenge in elderly populations due to their impact on functional independence and high comorbidity burden. Globally, the incidence of hip fractures is projected to increase dramatically, from 1.3 million in 1990 to an estimated 7.3-21.3 million by 2050 [19, 20]. These fractures often result from low-energy trauma and lead to hospitalization, with surgical intervention being the gold standard to restore function, reduce mortality, and prevent complications [21, 22]. This study assessed the impact of surgical timing on postoperative outcomes in elderly patients with femoral neck fractures treated by total hip replacement. The results demonstrated that earlier surgical intervention is associated with better functional outcomes and fewer complications. Specifically, the Harris Hip Score (HHS) showed no significant difference among groups at one month but was significantly lower in patients undergoing surgery more than seven days after the fracture at three and six months. These findings align with prior studies, such as J. Song *et al*., where delayed surgery (>21 days) resulted in lower HHS and health-related quality of life at one year [23]. Pressure sore development is another critical outcome. In this study, three patients developed pressure sores preoperatively, with two in the >7-day group and one in the 3-7-day group. The delay in surgical intervention significantly increased the risk of pressure sores, consistent with studies by Al Ani *et al*. and Leonard M.F. Rademakers *et al*., which found higher pressure sore incidence with delayed surgery [24-26]. Early surgery protocols were shown to reduce postoperative complications, emphasizing the need for timely intervention. Paolo Chiari *et al*. further highlighted risk factors for pressure sores, including advanced age, prolonged pain, and urinary catheter use. Protective measures, such as frequent repositioning, early rehabilitation, and the use of anti-decubitus mattresses, were associated with lower pressure sore rates [27]. These findings underscore the importance of comprehensive perioperative care alongside timely surgical management. While total hip replacement (THR) remains the preferred surgical modality for active elderly patients, its benefits over hemiarthroplasty include better functional outcomes, reduced acetabular erosion, and lower revision rates [28, 29]. Chammout *et al*. attributed this to the increased longevity and activity levels of today's elderly population, which demand improved hip function [30]. Expediting preoperative care is crucial to minimizing delays. Factors such as logistical challenges, medical comorbidities, and lack of resources often contribute to prolonged waiting times. Recent studies, including a systematic review and a prospective study of 116 patients, highlighted the role of trauma coordinators in fast-tracking hip fracture patients to surgery. These coordinators facilitate efficient preoperative processes by organizing operating room schedules, coordinating with radiology and ICU teams, and ensuring timely perioperative care [31, 32].

Conclusion

Timely surgical intervention within two days or between three to seven days yields superior outcomes for postoperative mobility and pain alleviation. Timely and intermediate surgical intervention diminishes the occurrence of pressure ulcer development and shortens the duration of postoperative hospitalization.

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