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Isolated hip fracture in the elderly and time to surgery: is there an outcome difference?

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ABSTRACT

Background Early operative intervention for hip fractures in the elderly is advised to reduce mortality and morbidity. Postoperative complications impose a significant burden on patient outcomes and cost of medical care. Our aim was to determine the relationship between time to surgery and postoperative complications/mortality in patients with hip fracture.

Methods This is a retrospective review of data collected from our institution's trauma registry for patients ≥65 years old with isolated hip fracture and subsequent surgery from 2015 to 2017. Patients were stratified into two groups based on time to surgery after admission: group 1: <48 hours versus group 2: >48 hours. Demographic variables included age, gender, race, and Injury Severity Score (ISS). The outcome variables included intensive care unit length of stay (ICU-LOS), deep venous thrombosis (DVT), pulmonary embolism (PE) rate , mortality, and 30-day readmission rates. Analysis of variance was used for analysis, with significance defined as a p value <0.05.

Results A total of 485 patients with isolated hip fracture required surgical intervention. Of those, 460 had surgery <48 hours and 25 had surgery >48 hours postadmission. The average ISS was the same in both groups. The average ICU-LOS was significantly higher in the >48 hours group compared with the <48 hours group (4.0 vs. 2.0, p<0.0002). There was no statistically significant difference between groups when comparing DVTand PE rate, 30-day readmission, or mortality rates.

Discussion Time to surgery may affect overall ICU-LOS in patients with hip fracture requiring surgical intervention. Time to surgery does not affect complication rates, 30-day readmission, or mortality. Future research should investigate long-term outcomes such as functional status and disability-adjusted life years.

Level of evidence III. Retrospective/ prognostic cohort study

INTRODUCTION

Isolated hip fractures (IHFs) are a debilitating injury diminishing the quality and life expectancy in individuals aged 65 and older. Data show that each year over 300 000 elderly people (>65 years) are hospitalized after sustaining hip fractures, with women experiencing more fractures than men.[1] Aside from gender, data support that patient demographics play a role in hip fractures. A population-based study including 317 677 patients concluded that Caucasians had the highest incidence of hip fractures across all race/ethnicities, whereas Native Americans had the lowest rates.[2]

A population-based cohort study comparing 110 563 patients with hip fracture with 552 774 members of the general population concluded that patients with hip fractures are at increased risk for myocardial infarcts and stroke.[3] A study of 3304 patients experiencing surgical delay concluded there was significantly higher risk of congestive heart failure in surgical delays greater than 2 days.[4] Additionally, a meta-analysis of 257 367 patients with IHF showed that a surgical delay beyond 48 hours from time of admission increased the risk of mortality.[5] These data indicate a wait time between injury and surgery of 24 to 48 hours may be a threshold for complications associated with IHF. One regional hospital adopted a 'surgery within 48 hours' of admission policy for patients with IHF, which reduced the hospital's average time to surgery from 72 hours to 36 hours and resulted in a decreased mortality rate.[6] This was supported by another study of patients with IHF which determined that expeditious surgery before 12 hours improved survival as compared with surgery after 12 hours.[7] One such study found that decreasing time to surgery within a 24-hour window between injury and surgery was associated with fewer days of severe pain experienced.[8] Furthermore, a meta-analysis of 13 478 patients with IHF demonstrated a significantly lower risk of common postoperative complications, such as postoperative pneumonia and pressure sores.[9] These studies signify a consensus among the literature that a decrease in time to the operating room (OR) results in decreased mortality rates and complications.

Therefore, current medical literature demonstrates that there are three major beneficial effects of decreased time to surgical treatment for patients with IHFs: decreased mortality rates, decreased postoperative complications, and decreased healthcare costs. The main objective of our study was to evaluate the relationship between time to surgery and postoperative complications/mortality in patients with IHFs.

STUDY DESIGN AND METHODS

This is a retrospective review of data collected from our level 1 trauma center's registry during the 3-year study period from January 2015 through December 2017. Data were collected from adult trauma patients ≥65 years old with IHF and subsequent repair during the 3-year study period. Patients were stratified into two groups based on time to surgery after admission: <48 hours (group 1) versus >48 hours (group 2). Demographic

characteristics include age, gender, race, and Injury Severity Score (ISS). Postoperative variables included intensive care unit length of stay (ICU-LOS), total length of stay, and complication rates defined as DVT and PE rate, 30-day readmission rate, and mortality rate. The decision to admit to the ICU postoperatively was made by the admitting service in consultation with the orthopedic surgeon. Evaluation for DVT or PE was done based on symptoms, with no routine screening examinations. Standard venous thromboembolism (VTE) prophylaxis as per institution policy was adhered to for each patient, which required chemoprophylaxis at admission and for 35 days postoperatively. All patients admitted with IHF were treated with the same VTE prophylaxis protocol; additionally, all patients who subsequently developed VTE or PE were not on any home anticoagulation or antiplatelet therapy, whereas 11.4% and 12% of patients were on home antiplatelet/anticoagulation therapy in the <48 hours and >48 hours groups, respectively. The trauma service retained responsibility for these patients but worked in consultation with the internal medicine service. Due to substantially uneven distribution of patients, we were unable to control for comorbidities between groups. Demographic characteristics and outcome measures were collected and compared between both groups. χ^2 test and analysis of variance were used for data analysis, with statistical significance defined as a p value <0.05.

RESULTS

A total of 485 patients with IHF who required surgical intervention were queried during the study period. Of those, 460 had surgery at <48 hours and 25 had surgery >48 hours postadmission.

Demographic and outcome data were collected and compared for patients undergoing surgery and stratified into two groups based on time to operation, <48 and >48 hours, as shown in table 1. Within the <48 hours group, 460 patients received surgery, of whom 345 (75%) were women and 115 (25%) were men, and 452 (98%) patients self-identified as Caucasian. In the >48 hours group, 19 (76%) were women and 6 (25%) were men, and 24 (96%) self-identified as Caucasian. The average age for patients was 84 years in the <48 hours group and 85 in the >48 hours group. The average ISS was similar in both groups (9 vs 9, p>0.05). Patients in the <48 hours group had a statistically significant shorter mean ICU-LOS of 2.0 days versus 4.0 in the >48 hours group (p<0.0002). The mortality rates were similar, 3% in the <48 hours group versus 0% in the >48 hours group (p>0.05). Readmission by 30 days was also similar at 3% in the <48 hours group and 4% in the >48 hours group (p>0.05). The DVT/PE rate was similar between the <48 hours and >48 hours groups (0.50% and 0%, respectively; p>0.05).

The average ICU-LOS was significantly higher in the >48 hours group compared with the <48 hours group (4.0 vs. 2.0 days, p<0.0002). There was no significant difference in the number of patients requiring ICU care between the <48 hours group and the >48 hours groups (6.7% vs. 12%, p>0.05). However, there was a significant difference in the total length of stay between the two groups (6.1 vs. 10.8 days, p<0.0001).

Table 1 Comparing time to operation versus outcomes in patients with isolated hip fracture, 2015 to 2017

	Time to operation <48 hours	Time to operation >48 hours	P values
Total number of patients with isolated hip fracture	460	25	
Gender (%)			
Female	75	76	NS
Race (%)			
White	98	96	NS
Other	2	4	NS
Age in years (mean)	84	85	NS
Average ISS	9	9	NS
Deep Venous Thrombosis rate (%)	0.50	0.0	NS
Readmission rate at 30 days (%)	3	4	NS
ICU-LOS (days)	2.0	4.0	<0.0002
Mortality rate (%)	3	0	NS

ICU-LOS, intensive care unit length of stay; ISS, Injury Severity Score.

DISCUSSION

IHF is a significant cause of morbidity and mortality in elderly patients due to osteoporotic bones and increased risk of falling due to poor balance, diminished dexterity, decreased range of movement, and lack of coordination. Nearly 350 000 hip fractures occur in the USA annually, with the risk of hip fractures increasing with each decade of life, most commonly occurring in women.[10] With the aging of the US population, it is estimated that by 2040 the number will increase to approximately 500 000 hip fractures annually.

In 2014, the American Academy of Orthopaedic Surgeons issued an evidence-based clinical practice guideline on hip fracture diagnosis and treatment in geriatric patients aged 65 years and older. They stated that moderate evidence supports that hip fracture surgery within 48 hours of admission is associated with better outcomes; however, delaying surgery may be necessary to stabilize patients with significant comorbidities and obtain preoperative medical clearance.[10] The exact effect of preoperative wait time for surgery is somewhat debatable. Numerous studies have explored the association between the timing of surgical repair and clinical outcomes, and it is generally accepted that surgery should be done within 24 to 48 hours of hospital admission. Unless extenuating factors indicate a palliative approach, the principal treatment for hip fracture is surgical stabilization. Even with surgery, the incidence of postoperative complications is high, and patients have a difficult rehabilitation period, with 1-year mortality estimated to be 20% to 30%. Without operation, the results are much poorer.[10] Patients undergoing non-operative management for hip fractures are at significantly higher risk for 30-day and 1-year mortality.[11] Current medical literature supports that surgery is an effective standard of care leading to improved functional outcomes, and lowers mortality, length of hospital stay, and postoperative complications.[12–16]

Our study concluded that surgery between <48 hours significantly reduced the ICU-LOS compared with surgery done after 48 hours, even though the rate of ICU admissions between these groups remained constant. This decrease in ICU-LOS has the potential to reduce the economic burden associated with hip fractures. It is estimated that the average cost is over $30, 000 and increases with patient age.[17] According to the study of the aforementioned regional hospital's 'surgery within 48 hours' policy, the result was a savings of an acute care bed stay cost of $152, 006 annually.[6] Another study implementing a similar system found that decreased time between admission to the hospital and surgery resulted in significant savings for high-volume hospitals.[18] Dy *et al*[19] assessed the cost-effectiveness of two strategies to reduce surgical delay to less than 48 hours. The first reduced time by accelerating preoperative evaluation,

whereas the second added an additional on-call OR surgical team. Both strategies were cost-effective with an incremental cost-effectiveness ratio of $2318 and $43 154 per quality-adjusted life year, respectively. Another study showed expedited surgical intervention admissions were associated with shorter length of stay, producing an average cost reduction equal to $15 400 per patient.[20 2122] Although a cost analysis was not performed between the two groups in our study based on availability of data, it is possible that decreased ICU length of stay in the <48 hours group would be associated with a corresponding reduction in overall cost of hospital admission. Future research is indicated to support this at our institution and to establish policy for time to OR to decrease the total cost for both the patient and the hospital. Aside from reduced ICU-LOS, our findings revealed that the majority of patients presenting with hip fracture are Caucasian. This is supported by the established fact that epidemiologically Caucasians have one of the highest incidences of hip fracture.[2]

Although the findings of our study are supported by data in the literature, there are limitations to our study. Due to the large difference in patient distribution between the <48 hours time to OR cohort and the >48 hours cohort, we were unable to control for comorbidities between groups. Future research should focus on a more balanced sample size matched for age, gender, race, and comorbidities using standardized scoring such as the Charlson Comorbidity Index. Given the low rate of additional postoperative complications, this study focused specifically on VTE and did not collect data on other outcomes such as myocardial infarction (MI) or cerebrovascular accident (CVA). Future studies at higher volume centers should include additional postoperative complications in final data analysis. Also, given the transient nature of the patient population seen at our center, 30-day mortality was used instead of 1-year mortality. Many patients in this setting are lost to follow-up at the 1-year mark. Additionally, no data were collected on final disposition of patients at discharge, limiting our ability to evaluate quality of life between the two groups. There are also a myriad of other complications, such as pneumonia, delirium, or pressure ulcers, that were not captured that would be of interest. Another limitation of this study is the lack of categorization of type of hip fracture. Further analysis should stratify patients by fracture type (intracapsular, intertrochanteric, vs. subtrochanteric) and surgical intervention (percutaneous pinning, intramedullary nailing, total hip arthroplasty). Although the results of this study are similar to those of studies with larger sample size, a potential limitation is the number of patients included in our study. In addition to our study, a potential limitation in all studies evaluating the effects of surgical delay on risk of mortality, DVT, ICU-LOS, and post-surgical complications is the lack of definitive guideline of what time-frame constitutes a surgical delay. Some studies describe early surgery as <6 and <12 hours, whereas others define it as 24 to 48 and <2 days; the same holds true for defining surgical delay, with some studies defining it as >12 hours, >48 hours and >72 hours.[1 5 11 12 18 22]

CONCLUSION

Time to surgery may affect overall ICU-LOS in patients with IHF requiring surgical intervention. This decrease in ICU-LOS associated with expedited hip fracture surgery may have the potential to produce large healthcare savings. Time to surgery did not affect complication rates, 30-day readmission, or mortality. Ideally, surgery should be performed within the first 48 hours of presentation to the hospital as per current generally accepted guidelines; however, in some patients who need medical stabilization and preoperative optimization of comorbidities, it can be safely delayed after 48 hours of admission but will be associated with an increased length of stay. Future research should investigate long-term outcomes such as postoperative functional status, time to recuperate back to baseline condition, and disability-adjusted life years.

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