Correlation between Hip Fracture Surgery and Increased Risk for Heart Failure in Older Patients

Abstract

The present study evaluates the correlation between Hip Fracture Surgery and Increased Risk for Heart Failure in Older Patients. Heart failure leads to other complications in patients with hip fractures as well as post-operative ICU care, longer hospital admissions, high financial and health costs, and increased risk of hospital-acquired illnesses such as pneumonia, bedsores, postural deconditioning, etc. The relationship between the length of hip surgery and heart failure is significant. The underlying factors that increase the risk of heart failure after surgery include longer stress of surgery that increases the load on the heart. Hip replacement surgery has direct effects on the heart leading to various heart diseases and the worst-case scenario results in a heart attack. When accompanied by a previous history of heart attacks, it could make the percentage of heart failure in hip replacement patients, devastatingly high. Complete evaluation of the patient and planning accordingly helps the patient to decrease the risks of surgery and attain fast and better recovery.

Keywords: *Heart Failure*, *Hip Fracture*, surgery, post-operative ICU care

Introduction

Hip fractures are the most common type of fracture in elderly patients above the age of 60 years. These fractures constitute proximal femoral fracture[1] and acetabulum[2]. Most common are proximal femoral fractures including fractures of the neck of the femur, subtrochanteric, and intertrochanteric fractures[3]. Out of all the hip fractures, neck of femur fractures and intertrochanteric fractures account for more than 90% of fractures. According to a study in

[1] Femoral fractures: Fractures involving femur bone (bone of thigh).
[2] Acetabulum fractures: Fracture of part of hip bone that forms joint with femur bone.
[3] Subtrochanteric and intertrochanteric : Trochanter is bony prominence present on femur bone. Fractures below the trochanter are subtrochanteric and involving the trochanter are intertrochanteric fractures.

China, due to the increasing population of elderly people, hip fractures will exceed by more than 5000/year. The risk of hip fracture increases with the age of the patient. (1)

Complications associated with Hip Fracture Surgery:

According to clinical studies, it has been found that the incidence of heart failure after surgery of hip fractures in elderly patients is common and life-threatening. Heart failure leads to other complications in patients with hip fractures as well as post-operative ICU care, longer hospital admissions, high financial and health costs, and increased risk of hospital-acquired illnesses such as pneumonia, bedsores, postural deconditioning, etc. The most effective way to decrease the risk of intra-operative or postoperative heart failure is to analyze the factors that may be responsible for such complications. These factors include the following:

- Comorbidities such as hypertension, diabetes, ischemic heart disease
- Older age more than 65 years
- Lung diseases
- Prolonged Surgery

In addition to this, perioperative management is also important in the management of elderly patients due to systemic diseases and deteriorating organ functions. (2)

Factors Influencing High Mortality Rate in Elder Patients:

According to a comparative study, the risk of hip fractures after the age of 85 years exceeds 15-20% as compared to people aged 60-65 years old. After the age of 60 years, a significant functional decline takes place in all the organ systems of the body. Due to this functional decline, people above 60 years of age are at an increased risk of chronic diseases like heart failure, diabetes, hypertension, etc. causing increased morbidity and mortality rate in elderly patients who have suffered hip fractures. Furthermore, the studies have proposed that the mortality rate in patients with hip fractures is approximately 1.5-3 times higher than in those without hip fractures. The high incidence of hip fractures is a major challenge for orthopedic physicians and

surgeons because of several factors including comorbidities, the physiological decline in functions, and other pathological conditions. (3)

(1) Anemia is a Strong Risk Factor for Heart Failure after Hip Surgery:

Previous studies have shown that prognosis (what type of prognosis after hip surgery) after hip fracture surgery is strongly associated with anemia. According to a retrospective study, the mortality rate of patients after hip surgery at 3 months and 1 year is higher in patients with anemia than the patients without anemia. This study confirmed that anemia is an independent risk factor for heart failure and postoperative complications in patients with hip fractures. Hip replacement surgery in the elderly is associated with a critical level of blood loss heightening the need for blood transfusion to relieve the postoperative anemia caused by the huge amount of blood loss. At this later age in life people tend to be accompanied by certain co-morbidities including aging, reduction of physiological reserves of the body, and a disorder of hematopoiesis. The studies thus explain that anemia in the body leads to a higher incidence of heart failure and thus increased incidence of postoperative mortality. The mechanism underlying this effect of anemia is decreased supply of oxygen to tissues that aggravate the release of nitric oxide causing vasodilatation. This causes an increase in water retention in the body aggravating the symptoms of heart failure. (4)

(2) Prolonged Length of Surgery is a Strong Risk Factor for Heart failure after Hip surgery

The relationship between the length of hip surgery and heart failure is significant. The underlying factors that increase the risk of heart failure after surgery include longer stress of surgery that increases the load on the heart. Apart from those patients require more fluid infusion during prolonged surgery. The increased amount of fluid increases the cardiac preload which can result in more stress on the heart. More fluid will enter the tissues including lung tissue which will worsen the patient's condition and enhance the risk for heart failure. After undergoing total hip replacement surgery there is a significant change in factors secondary to surgical trauma leading to cardiovascular events. During surgery, certain factors such as pain, hypothermia, a shift in the volume of body fluids, fasting, and anesthesia withdrawal may inflict devastating effects on the human body. These effects may lead to platelet activation, activation of

coagulation, cortisol secretion, catecholamines, and enhanced oxygen consumption. These events collectively result in thrombosis of the blood leading to myocardial infection. Myocardial infarction being the most common perioperative complication leads to left ventricular dysfunction and resultantly heart failure.

(3) Age more than 60-65 years is a strong risk factor for Heart Failure after Hip Surgery

Patients with ages more than 60-65 years carry a high rate of postoperative cardiac complications including heart failure after surgery. In these patients, the incidence of cardiac complications is 8% high as compared to people less than 60 years of age. It is due to the fact that increased age results in the degenerative process throughout the body including the vital organs. The drugs given for anesthesia and the stress of surgery can lead to a serious effect on the heart, thus leading to cardiac failure and other serious adverse effects. As the age advances above 60 body start getting rusty and many organs and components of the body fail to function properly along with associated co-morbidities. During hip fracture repair surgery, the change in volume of blood, hemostasis, and platelet aggregation caused during this major surgery fails to recover leading to an increase in stress on the heart by volume overload accompanied by thrombosis leading to ventricular dysfunction resulting in heart failure. (5)

Procedures Requiring Less Time are the First choice for High-Risk Patients:

According to a comparative study, the risk of hip fractures after the age of 85 years exceeds 15-20% as compared to people aged 60-65 years old. After the age of 60 years, a significant functional decline takes place in all the organ systems of the body. Due to this functional decline, people above 60 years of age are at an increased risk of chronic diseases like heart failure, diabetes, hypertension, etc. causing increased morbidity and mortality rate in elderly patients who have suffered hip fractures. Furthermore, the studies have proposed that the mortality rate in patients with hip fractures is approximately 1.5-3 times higher than in those without hip fractures. The high incidence of hip fractures is a major challenge for orthopedic physicians and surgeons because of several factors including comorbidities, the physiological decline in functions, and other pathological conditions. (1)

Preoperative Evaluation and Monitoring is Essential to Prevent Heart Failure:

According to studies, patients over the age of 70 have about an 8% incidence of heart failure after lower limb surgeries, including hip fractures. Therefore, detailed examination including consultation with the anesthesia team and optimization by medical physicians should be performed before declaring the patient “fit for surgery”. Extra attention to anesthesia medications, operation time, and strict perioperative monitoring are keys to better outcomes and decreasing the risk of heart failure. (6)

Literature Review:

According to a population-based study, heart failure is the most prevalent condition in patients undergoing surgery for hip fracture. Patients that have pre-existing heart failure are at high risk of developing postoperative morbidity and mortality as compared to those with no pre-existing cardiac illness. In the recent past, many studies have focused on the epidemiology of heart failure in patients with hip fractures, however, data regarding the complications of hip fracture are remarkably low. According to the AHA preoperative cardiac evaluation guidelines, due to fewer data available, fractures along with other orthopedic procedures are thought to pose less drastic effects on heart health and so are categorized as "intermediate risk" before preparation for cardiac surgery. But the circumstance says contrarily. The mortality rate fluctuates with the change in parameters and the most important parameter is the period spent in the postoperative care. According to the AHA guidelines, it shall be assumed that orthopedic patients who suffer have less than a 5% mortality rate, but it is not completely true. (7)

According to the survey done by AHA with data gathered from the total joint registry, the mortality rate in patients undergoing 30-day postoperative care after elective total hip arthroplasty was calculated and documented to be 0.6%. Whereas, these statistics were proven wrong and invalid by the current investigation, which shows that the studies carried out by ACC/AHA are not valid for frail patients undergoing hip fracture repair. The guidelines provided by the ACC/AHA preoperative cardiac evaluation was proven wrong by the recent studies, as the ratio was far more than they listed. After surgery, results are completely antagonistic to the

guidelines presented by the institute; as this poses a greater threat to the people than we could have imagined. According to the latest research, the percentage of people suffering from a newly developed heart attack within 7 days after getting a total hip replacement is far more than the AHA/ACC guidelines have predicted. Hip replacement surgery is far worse for patients having preexisting heart problems or having a previous history of heart attacks. (8)

Hip replacement surgery has direct effects on the heart leading to various heart diseases and the worst-case scenario results in a heart attack. When accompanied by a previous history of heart attacks, it could make the percentage of heart failure in hip replacement patients, devastatingly high. Hence, the rate of mortality caused by a heart attack after hip replacement surgery is incredibly more in patients having a heart attack before the surgery than in those who didn't. Still, there is no clear evidence that how hip fracture repair is the cause of heart failure in newly operated patients. Therefore, to prove this theory further studies were conducted before coming to any decisive conclusion. A prospective cohort study was carried out in a hospital in Great Britain in which 2448 patients were studied after having a hip replacement surgery. Resultantly, there was a 5% rate of patients who developed heart attacks while being admitted to the hospital after getting the surgery. This ratio increased with an increase in the time interval of the study being continued. After one year of study, the rate of mortality by heart failure was increased up to 11.3 in patients undergoing hip fracture repair.

The study carried out in a hospital in Great Britain did not distinguish a heart attack from other cardiovascular morbidities. Their study did not red label the preoperative heart disease as a risk factor for an increase in the rate of mortality by post-operative heart failure in hip fracture repair patients. The results we obtained helped us to understand the relationship between pre-operative heart failure and death by post-operative heart failure after undergoing hip replacement surgery. This advanced literature also leads us to the conclusion that heart failure is a distinguished complication of hip fracture repair. (9)

The studies done previously did not list anything regarding the duration of the patient to be admitted after a hip replacement surgery and its relationship with pre-operative heart disease. There is no proper evidence in previous literature regarding the increase in the risk of heart failure with an increase in the duration of stay in the hospital after a hip fracture repair or replacement. The time length of stay in the hospital after getting a hip replacement varies in

different researches. Thus, the results demonstrated that patients suffering from any previous heart disease before the surgery have to be hospitalized longer than the patients who didn't have preoperative heart complications. The rate of heart failure and postoperative mortality were also considered in our study as men have a relatively high mortality rate than women even though the rate of heart failure after surgery in both men and women is almost the same. According to the previous studies, the rate of mortality in men is considerably higher after undergoing hip replacement surgery. The negligence of the male community to treat osteoporosis leads to an increased risk of hip fracture and susceptibility to getting infected and as a result, an increased ratio of cardiovascular diseases among men is the most accepted and possible cause for an increased rate of postoperative mortality among men. (10)

The study carried out by the hospital of Great Britain was very helpful in providing the necessary information regarding the care provided to the patient before undergoing hip fracture repair or replacement surgery to protect the patient from having any cardiovascular disease. Thus, protecting a person from heart failure and lowering the postoperative mortality rate. These studies suggest that considering the orthopedic operation as an intermediate risk according to the guidelines provided by the AHA/ACC has failed to portray the real risk of morbidity associated with hip replacement patients. Thus, an increased risk of heart failure related to hip fracture surgery has brought the attention of medical practitioners to pay attention to preoperative care for such patients regarding medication reconciliation and volume status. Counseling of the patient and family regarding preoperative care in patients with perioperative heart failure is necessary. They should be clarified about the ramifications of heart failure including longer hospitalization, postoperative heart failure, and the risk of mortality.

This research is a cohort study that has the cons of containing biases and has many limitations. The factors responsible for causing heart failure postoperatively are still unclear but a few factors that are reported to be related to causing heart failure about hip replacement include the functional status, the age of the patient, and various co-morbidities. To reach conclusive results and to minimize the limitations and sampling bias we tried to enumerate all the hip fracture surgeries performed in a facility. Utilizing all the inpatient and outpatient medical care records we succeeded in achieving 100% follow-up of the respective patients in that community. (11)

The bias present in the study should be minimized to get conclusive information. To minimize measurement bias objectively defined outcomes should be employed. The limitation to the diversity of the population was not eliminated because our research groups consist mainly of a single and predominantly white community with a percentage of above 95%. Whereas in the previous studies we have concluded that the socioeconomic status and incidence rate of heart failure after hip replacement surgery in other societies of the United States and our study group are the same. Framingham criterion is a well-known criterion to diagnose individuals with heart disappointment that was employed to clinically determine the rate of heart failure among individuals. But this also contains a limitation that the Framingham criteria are not 100% accurate and it may not diagnose heart failure patients inappropriately and cause a false elevation of heart failure incidence rate as a postoperative complication or preoperative comorbidity. (12)

During the study period, some of the patients under study had recurrent hip surgeries and are so included repeatedly in the statistical analysis. If such patients are included in the study, they may be responsible for providing incorrect estimates of standard error or inaccurately inflating the incidence rate of respective events. Whereas, such patients could prove to be clinically significant and explicit from both a functional and medical perspective and so are included in the statistical analysis. To achieve a meticulous and accurate value of the standard error assuming that both the subjects are correlated we utilized a robust estimator of variance in the model of Cox proportional hazards. Thus, we achieved a low proportion of these patients i.e., 8.4% which was about 94 out of 1,116 unique patients. Therefore, there is a need for therapeutic inventions and exceptional risk stratification in the future. To facilitate risk stratification there is an absolute need for more intense analysis of heart failure including differentiation between diastolic and systolic dysfunction. Enhancing the clinical effort and vigilance and ensuring compliance with the standard medications for heart failure may help to improve postoperative outcomes. To document the policy regarding reimbursement for the patients with hip fractures and the length of their stay could be formed by these studies on therapeutic interventions and risk stratification. (13)

Conclusion:

In conclusion, intraoperative and postoperative heart failure are common and serious complications in patients undergoing surgery for heart failure. The occurrence of heart failure in patients is due to a combination of several risk factors including age > 70 years, prolonged duration of surgery > 120 min, anemia, and comorbidities. To alleviate the risk of heart failure to a maximal extent, proper monitoring by the anesthesia and surgery team should be done and a multidisciplinary approach should be undertaken in case of high-risk patients. Shortening surgery time and correction of uncontrolled comorbidities are essential to improve patient outcomes after surgery and avoid heart failure. Complete evaluation of the patient and planning accordingly helps the patient to decrease the risks of surgery and attain fast and better recovery.

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