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Original Research Article

Assessing Risk Factor for Mortality after Proximal Femur Fractures in Elderly Patients during COVID-19 Pandemic & Identifying Modifiable Risk Factors

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Abstract:

Background: Proximal femoral fractures are more common in geriatric population and more commonly associated with low energy trauma. Females are more affected than males. 90% of femoral fractures are neck of femur and peri trochanteric fractures, rest 10% fractures are subtrochanteric.

Aims and Objective: To determine the impact of risk factors on 1-year mortality rate in patients who have undergone surgery for proximal femoral fractures in the time of COVID-19 Pandemic, & to determine the modifiable risk factors.

Material and Method: A prospective observational study was conducted among 30 cases of proximal femoral fractures. Inclusion criteria were age of patient 60 years or older, proximal femoral fractures, mortality outcomes within 1 year after surgery. Surgery was performed. Follow-up period was 12 months. At the end of follow up period, cases counted who survived and who died and risk factor distribution among dead patient's was assessed & modifiable risk factors were identified.

Results: The mean age was 78.1 years with Male: female ratio of 1:1.5. 30% have no comorbidities, 36.7% having single comorbidities & 33.3% participants were found with more than single co-morbidity and 5 cases (16.7%) belonged to American Society of Anesthesiologist (ASA) class III Most common fracture was transtrochanteric 16 cases (53.3%). Surgery was performed within 48 hours in 14 cases (46.7%) and it was delayed >48 hours in 16 cases (53.3%). Mean surgery duration was 2.9±1.8 hours with mean duration of hospital stay 13.7±6.4 days. Patients having mean VAS score of 7.4±1.3. 16 cases having preoperative mobility score <5 (53.3%), and 14 cases having ≥5 (46.7%) with mean score of 6.5±3. Mortality rate was 13.3%.

Conclusion: Older patients with proximal femoral fracture had 13.3% mortality within 1 year of surgery. The main risk factors were male gender, ASA class III, number of co-morbidities, longer waiting time until surgery, lower preoperative mobility score. Changing modifiable factor such as alcoholism, smoking, & Type A personality can decrease mortality in elderly within 1 year after surgery.

Keywords: Elderly, Mortality, Proximal Femur Fractures, Risk Factor, Trauma.

Introduction

Falls are main cause of morbidity and disability in the elderly [1]. 30% of people over 65 years of age fall each year [2], and in half of such cases, the falls are recurrent. The elderly are at an especially high risk of death after a fall [3]. 55% of all unintentional injury-related deaths among the elderly over 65 years of age are due to fall [4]. In a population-based retrospective cohort study of 312,758 hospitalizations, the 30-day mortality rate after falls was 2.9–4.2% [5]. Consequences of falls in the elderly often include fractures, immobility, impairment, and sometimes death. Falls are also the major cause of femoral fractures in the elderly [6]. According to Census 2011, India has 104 million older people (60+ years), constituting 8.6% of total population. Amongst the elderly (60+), females outnumber males [7]. Knowledge regarding proximal femur & hip joint anatomy and radiological correlation is necessary to well-known facts for Orthopedic surgeons for routine day-to-day practice [8]. Proximal femoral fractures involve neck of femur, Inter trochanteric/trochanteric and subtrochanteric fractures. Proximal femoral fractures are more common in geriatric population and more commonly associated with low energy trauma. Females are more affected than males. 90% of femoral fractures are neck of femur and peri trochanteric fractures, rest 10% fractures are subtrochanteric [9].

Increase in incidence of proximal femoral fractures with increasing age is mainly due to osteoporosis

and also related to increase in incidence of fall due to poor reflex [10]. The influence of comorbidities on a patient's chances of survival has been proven to be significant. Liver, cardiovascular, and respiratory diseases affect mortality rate [11]. In addition, comorbidities increase the incidence of postoperative complications that are proven to reduce survival rates [12].

Surgeries done within 48 hours of hip fracture results in decreased complications and mortality rate [13]. But certain studies which suggest that after proximal femoral fractures specially in elderly patient's, surgery should be delayed to allow physiological stabilization, correction of dehydration and treatment of associated comorbidity. But most of studies suggest early intervention [14].

Treatment methods mainly depends upon the factors like patient's age, activity before injury, time of surgery after injury, co-morbid conditions and fracture type. Femoral neck fractures in elderly are mainly treated with Hemiarthroplasty or Total Hip arthroplasty depending upon the condition of the patient. Closed reduction and

internal fixation can also be considered in cases of undisplaced neck of femur fractures [15]. Trochanteric fractures are treated with Dynamic hip screw (DHS) or Proximal Femoral Nailing (PFN). In Elderly patients, especially female's primary arthroplasty is also a good option as the bones are osteoporotic [16]. The research regarding mortality after proximal fracture of femur is not well documented in both developed and developing nations. The previous clinical condition and Cardiovascular risk factors are well associated with one-year mortality after proximal femoral fracture. The knowledge of details analysis of cases died in hospital and death up to 1 year are helpful in taking decision for the treatment choice and start preventive steps [17].

In COVID-19 PANDEMIC surgeries are delayed due to many factors, like patient's hesitation to come to hospitals and when they finally come to hospital, time already elapsed and it takes 2 to 3 more days to confirm patient negativity for RT PCR sampling.

The purpose of this study is to assess the impact of risk factors on one year mortality rate & modifiable risk factor after proximal femoral fractures in time of COVID-19 PANDEMIC.

Material and Methods

This prospective observational study was conducted in Department of Orthopaedics at MMMCH, Kumarhatti, Solan, Himachal Pradesh, India, from November 2020 to May 2022. 30 cases of proximal femoral fracture were included in the study, based on some inclusions and exclusions criteria's (Table 1), and after getting well-informed written consent and institutional ethical committee clearance.

Table 1: Study participants inclusion and exclusion criteria's:

Inclusion criteria	Exclusion criteria
Age ≥60 years	Age ≤60 years
Proximal femoral fractures	Shaft femur & distal femur fracture
Mortality within 1 year after surgery	Mortality after 1 year of surgery

Detailed History and clinical examination were done. Demographic data including age, sex, socio-economic statutes, rural or urban background was obtained. Patient's comorbidities were noted. Patients were classified according to ASA classification. Proximal femur fracture among cases were classified into femur neck fracture, transtrochanteric fracture, subtrochanteric fracture and others. Patient's preoperative mobility score was noted. After getting pre-anesthesia checkup (PAC) fitness, surgery was done. Surgery delay either performed within 48 hours or after 48 hours of admission, surgery duration and patient's duration of hospital stay was noted. After surgery VAS score was collected. Follow-up period was 12 months. After final follow up period of 12 months, cases counted who survived and who died and risk factor distribution among dead patient's was assessed.

Results:

30 cases of proximal femur fracture, included in study having age groups between 60-70 years 10 cases (33.3%), 71-80 years 14 cases (46.7%), 81-90 years 5 cases (16.7%), above 90 years 1 case (3.3%) with mean age of 72.0±8.5 years. 12 cases were male (40%), 18 cases were female (60%) with male to female ratio 2:3 (Table 2).

Table 2: Demographic data of patients.

Parameters		Numbers	Percentage (%)
Age Groups (Years)			
	60-70	10	33.3
	71-80	14	46.7

	81-90	05	16.7
	>90	01	3.3
	Mean±SD 72.0±8.5		
Gender	Male	12	40
	Female	18	60

9 cases having 0 comorbidity (30%), 11 cases having 1 comorbidity (36.7%), 10 cases having >1 comorbidity (33.3%) (Table 3).

Table 3: Patient Comorbidities.

Comorbidities	Number	Percentage (%)
0	09	30
1	11	36.7
>1	10	33.3

According to ASA classification 7 cases were type I (23.3%), 18 cases were type II (60%), 5 cases were type III (16.7%) (Table 4).

Table 4: Distribution of study participants according to ASA classification

ASA Classification	Number	Percentage (%)
I	07	23.3
II	18	60
III	05	16.7

11 cases having femur neck fracture (36.7%), 16 cases having transtrochanteric fracture (53.3%), 2 cases having subtrochanteric fracture (6.7%), other fracture 1 case (3.3%) (Table 5).

Table 5: Type of fracture distribution among study participants

Fracture Types	Number	Percentage (%)
Femur Neck	11	36.7
Transtrochanteric	16	53.3
Subtrochanteric	02	6.7
Others	01	3.3

Surgery was performed within 48 hours in 14 cases (46.7%) and it was delayed >48 hours in 16 cases (53.3%). Mean surgery duration was 2.9±1.8 hours with mean duration of hospital stay 13.7±6.4 days. Patients having mean VAS score of 7.4±1.3. 16 cases having preoperative mobility score <5 (53.3%), and 14 cases having ≥5 (46.7%) with mean score of 6.5±3.4 (Table 6).

Table 6: Distribution of study participants according to preoperative mobility

Preoperative mobility score	Number	Percentage (%)	Mean±SD
<5	16	53.3	6.5±3.4
≥5	14	46.7	

26 Cases survived (86.7%), and 4 cases died (13.3%). Table 7 showing risk factor distribution among dead patients.

Table 7: Risk factor distribution among dead patients

Risk Factor		Value	p-value
Age (Mean±SD)		86.7±3.7	
Gender	**Male**	3 (75)	0.125
	Female	1 (25)	
ASA Classification	**II**	0 (0.0)	0.010
	III	4 (100.0)	
Comorbidities	**≤1**	0 (0.0)	0.039
	≥1	**4 (100.0)**	
Surgery delay (Hours)	**<48 hours**	**0 (0.0)**	**0.044**
	>48 hours	**4 (100.0)**	
Preoperative mobility score	**<5**	**4 (100.0)**	**0.044**
	≥5	**0 (0.0)**	

Discussion

Present study was conducted with objectives to determine the impact of risk factors on 1 year mortality rate in the patient who has undergone surgery for proximal femoral fractures in the time of COVID 19 PANDEMIC and to determine the modifiable risk factors.

Sanz-Reig J et al [18] observed that advanced age is closely associated with in-hospital mortality. This result is compatible to those, that report age as the primary risk factor contributing to mortality in elderly patients with hip fractures of any traumatic cause. Higher mortality rates were found in patients >85 years than in those aged 75 –85 years.

Paksima N et al [19] observed mortality rate after surgery for proximal femoral fractures was 4.7%. Meessen JMTA et al [20] said that sex, age group, number of co-morbidities, surgical delay had a significant influence on the average survival time of the included patients. Brauer CA et al [21], reported 1-year mortality after sustaining a hip and femur fracture has been estimated to be 14% to 58%.

Schnell S et al [22] noted the mean age of 84.8 years. González-Rozas M et al [10] observed that Older age increases the incidence of sustaining a hip & femur fracture and its associated mortality. Findings are comparable to our study where highest number of participants noted in 71 to 80 years age group followed by 60 to 70 years and mean age was 72.0 years.

Meessen JMTA et al [20] observed that the mean age 85.6 years which is higher than the present study. Braithwaite RS et al [23], noted that mortality is increased with increase in age, after femur bone fracture surgery. They found, mortality rate was 2% for ≤70 years and >27 % for ≥90 years. However, Hannan EL et al [24], have not found any significant association between age and mortality after fracture.

Present study found male:female ratio was 1:1.5. Chie WC et al [25] noted that the average female: male ratio of hip fracture in Taiwanese population was about 1.6 –1.8, lower than those in many countries. Shao CJ et al [26] found that the men had higher mortality rates in hospital than the women, albeit the latter outnumbered men in all types of hip fractures.

Sheikh HQ et al [27] said that Males have higher bone mass than females. However, when males are much older, their bones exhibit an exponential loss in bone mass compared to females. Chou SE et al [28], noted male: female ratio of 1:2.5 means higher mortality among females which does not correlate with the findings of present study.

Marottoli RA et al (12) observed that women have a higher risk of developing a hip & femur fracture, although mortality rates are higher in men. Mechanism behind this phenomenon is not yet clear. Meessen JMTA et al [29] found, male: female ratio 1:1.5 which correlate with the present study.

Chou SE et al [30] found Hypertension was the most common co-morbidity followed by Diabetes Mellitus, findings are comparable with the study done by Meessen JMTA et al [29].

Nickolas TL et al [31] reported that individuals with chronic kidney disease have a subsequently higher fracture risk long before the implementation of renal replacement therapy. Robertson L et al [32] noted that post hip fracture mortality was increased in patients with stage 4 chronic kidney disease. Coco M et al [33] observed the 1-year mortality rate post-hip fracture is 55 –64% for dialysis patients, which is a 2.7-fold increase over the non-fractured dialysis population.

Franco LG et al [17] said that previous physical body condition and Cardiovascular risk factor has been related to the mortality after proximal femoral fracture. Roche JJ et al [34] observed higher mortality in cases who have more than 3 co-morbidities.

Present study found that highest number of participants noted in ASA class II. Gurusinghe S et al (30) noted most of patients belonged to ASA class III.

Present study found that transtrochanteric fracture was the most common fracture noted among study participants followed by femur neck fracture.

Mean duration of surgery was 2.9±1.8 hours. This finding is comparable with the study done by Jennifer MTA et al. Surgery was done among 46.7% participants within 48 hours of injury and in 53.3% was done after 48 hours of injury. This finding is comparable with the study done by Meessen JMTA et al [29].

According to National Institute for Health and Care Excellence [30], Surgical delay is defined as the time from hospital admission to surgery. Current British guidelines dictate that patients preferably be operated within 24 hours of trauma; however, due to unstable patient condition or hospital-specific work arrangement, this is not always possible.

Bottle A et al [31] concluded that there is no conclusive answer regarding if and how surgical delay could influence mortality after hip fracture. Some studies found evidence of a negative effect, whereas others reported an increase in mortality for delays longer than 4 days or showed no significant effect.

Orosz GM et al [32] reported that surgical delay is not related to a higher mortality rate but is related to more complications. Leung F et al [33] showed that although there is no conclusive evidence of the effect of surgical delay on mortality rate, there is evidence that early surgery improves a patient's scoring on other variables, such as morbidity, hospital stay, and pain.

Correa JGL et al [34] observed the mean delay in surgery from hospitalization was 9.4 days, less than the study done by Souza et al [35]. Morghen S et al [36] studies noted the delay in surgery after hospitalization increases the chances of death.

Prospective study of 850 patients done by Al-ani AN et al [37] concluded that early surgery after admission leads to lesser hospital loss, less pressure ulcers, and greater likelihood to return to independent living. McGuire KJ et al [38] in an analysis of 18,209 Medicare recipients who underwent surgery for a hip fracture, a delay in surgery of ≥2 days from admission was associated with a 17 % increase in 30-day mortality. Majumdar SR et al [39] have not shown a decrease in mortality with surgery within 48 hours of admission.

Schnell S et al [22] found average length of hospital stay was 4.3 days. Finding is comparable with study done by Meessen JMTA et al [20] In the United States during the year 2003 in which average hospital stay after fracturing the hip was 7 days [40].

Correa JGL et al [40] said that the risk of death remains even after hospital discharge. Guerra MTE et al [41] noted mortality rate to 36% two years after fracture, and 60% after forty-eight months after the occurrence.

Parker MJ et al [10] said that preoperative mobility score is a tool to assess preinjury mobility function and help stratify 1-year mortality after proximal femur fractures. Schnell S et al [22] noted mean preoperative mobility score was 5.

Schnell S et al [22] found that this index was predictive of 1-year mortality in our study population. The Odd's ratio of 1-year mortality were 2.79 (P ¼ .01) and 2.17 (P ¼ .05) for low (0-4) and medium (5-8) mobility scores, respectively. Prospective 10-year study done by Pakisma N et al [19] found, 28 % increased risk of mortality. This is consistent with previously published data. Aharonoff GB et al [42] analyzed 612 community-dwelling geriatric patients in whom prefracture dependency in basic ADLs predicted an increased hazard ratio 1-year mortality of 2.422.

Present study found mortality rate was 13.3% comparable to study done by Pakisma N et al [19] with mortality rate was 11.9% after 1 year follow-up.

Conclusion

Although Risk factors like Age, sex and preoperative mobility score cannot be modified but modifiable Risk factors like surgical delay, comorbidities like HTN, Diabetes mellitus, obesity and other diseases significantly affects the mortality outcome within 1 year after surgery and can be optimized.

Other modifiable factors such as Alcoholism, Smoking and Type A personality also associated with co-morbidities and changes in these modifiable factors can lead to decrease in mortality in elderly within 1 year after surgery**.**

Increase in incidence of proximal femoral fractures with increasing age is mainly due to osteoporosis and also related to increase in incidence of fall due to poor reflex.

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