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Risk factors for mortality in delayed intertrochanteric fractures

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Abstract

We aimed to figured out the risk factors of one year mortality in intertrochanteric hip fractures with delayed operation more than 72 hours. 96 out of 226 patients with proximal femoral fracture included in this study. Hemogram, blood urine nitrogen (BUN), creatinine, sodium, potassium and serum albumin levels are recorded from their blood test at administration of hospital. Time to theatre and postoperative needs for intensive care are recorded. Mobility functions before fracture and after 3 months of operation are assessed by mobility part of Barthel index. Multiple logistic regression analysis was performed to estimate the simultaneous effects of important covariates. In univariate model, age(p=0.0027), ASA(p=0.00), loss of mobility(p=0.00), bone union time(p=0.001), blood transfusion(p=0.026), albumin(p=0.004) and mobility after operation (p=0.001) were associated with mortality but in the final model for multivariate regression analysis loss of mobility level (p=0.001) and bone union time (p=0.02) were found to be independent risk factors of mortality. In postoperative period mobilization is the most important variable that we could changed in intertrochanteric fractures to decrease mortality. Whatever the timing of operation, gaining the mobility as soon as possible should be the goal of our treatment.

Keywords: Risk factors, hip fractures, serum albumin, mobility, mortality

Introduction

Intertrochanteric fractures are common in elder population and it's common leading cause of hospitalization [1]. High mortality rates are associated with many factors like delayed operation time, routine blood tests, rehabilitation programs and American Society of Anaesthesiologists (ASA) scores, but there is still dissidence about the risk factors of mortality. Mortality increases especially in first year after the operation and decrease to normal percentages in second to third years [2]. For identifying these factors different risk prediction models are created but a consensus still not achieved [3].

To decrease mortality rates immediate surgery and rehabilitation programmes are main stays of recent studies. But even late or delayed operation groups of these studies time to operation means are between 24 to72 hours [4-6] But what about patients operated after 72 hours or more? Main reasons for delay are co-morbidities of patients and antiaggregant use in elderly patients. Lack of surgical rooms and public holidays are the other reasons of delay. In literature many studies are based on Cochrane reviews or data's of developed countries. Immediate operation for an elderly people with many co-morbidities could be difficult and also risk factors for mortality could change. High mortality rates still stands as a problem for these fractures. In this study we aimed to figured out the risk factors of mortality in intertrochanteric hip fractures with delayed operation more than 72 hours.

Material and Method

This study was approved by the local ethics committee. A total 226 patients over 60 years old with intertrochanteric fractures who are treated with a proximal femoral nail (PFN) between 1 January 2011 to 1 May 2014 retrospectively. Patients with multiple fractures and that have less than 1 year follow up are not included in study. Patients with intertrochanteric fracture over 60 years old who treated with proximal femoral nail included in this study. As the main reason to evaluate the delayed treatment results patients operated within 72 hours excluded. Because of patients general health status, lack of surgical rooms and public holidays 117 of them could not operated in first 72 hours. 21 patients were lost during 1 year follow up, and 96 patients were included in this study. Intertrochanteric fractures are classified according to AO/OTA classification system. Hemogram, blood urine nitrogen (BUN), creatinine, sodium, potassium and serum albumin levels are recorded from their blood test at

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administration of hospital. Time to theatre and postoperative needs for intensive care are recorded. Patients general health status are assessed by the classification system of the ASA at the time of hospital admission. Class I indicates a normal, healthy patient; Class II, mild systemic disease; Class III, severe systemic disease that is not incapacitating; Class IV, a severe incapacitating systemic condition that is a constant threat to life; and Class V, a moribund patient. No patient in this study was Class V [7]. Mobility functions before fracture and after 3 months of operation are assessed by mobility part of Barthel index [8]. According to Barthel index grade 0 is immobile; grade 1 is wheelchair independent, including corners, etc.; grade 2 walks with help of one person (verbal or physical) grade 3 is independent (but may use any aid, e.g., stick). All patients were forced to weight bear as tolerated in early postoperative period with crutches. Patients was followed by a two-week range till 3 cortex fracture healing is achieved. After healing is achieved 3th,6th months and 1st year controls were made.

Descriptive statistics of the data mean, standard deviation, median minimum, maximum, frequency and ratio values were used to describe study population. Kolmogorov Simonov test is used for the distribution of the variables. Mann-Whitney U test used for evaluation of quantitative data and chi-square test for qualitative data. To estimate the simultaneous effects of important covariates (i.e., patient age, gender), multiple logistic regression analysis was performed by looking at the odds (with 95% confidence intervals (CI)). Only the variables that added significantly to the prediction were retained in the final model. P values of 0.05 or less were considered significant. SPSS 22.0 programme is used for analysis.

Results

A total number 96 patients included in study. 38 (39.6%) of them are males and 58 (60.4%) of them were female. Demographic characteristics of the patients are shown in Table 1.

Table 1. Demographic characteristics of the patients

		Min-Max			Median	mean.±s.d./n-%		
Age		60	-	97	75	71,8	±	14,8
Operation duration (minutes)		30	-	190	75	78,5	±	29,5
ASA		1	-	4	2	2,2	±	0,9
Time to Theatre (day)		3	-	19	8	7,8	±	4,0
Union time (week)		6	-	20	12	11,6	±	3,5
Blood transmission (units)		0	-	14	0	1,4	±	2,2
Hemoglobin		6	-	15	12	11,8	±	1,9
BUN		12	-	484	42	48,6	±	50,4
Creatinine		0,4	-	67,0	0,8	2,2	±	8,2
Mortality time (week)		2	-	51	24	24,2	±	15,4
Sodium		125	-	144	138	136,8	±	3,6
Potasium		3	-	7	4	4,2	±	0,6
Albumine		2	-	5	4	3,4	±	0,6
Side	**Right**					36		37,5%
	Left					60		62,5%
AO/OTA classification	**31A1**					43		44,8%
	31A2					26		27,1%
	31A3					27		28,1%
PFN	**Standart**					81		84,4%
	Long					15		15,6%
Post operative Intensive Care	**No**					63		65,6%
	Yes					33		34,4%
Mobility before fracture	**Grade 1**					9		9,4%
	Grade 2					10		10,4%
	Grade 3					77		80,2%
Mobility after Operation	**Grade 0**					12		12,5%
	Grade 1					25		26,0%
	Grade 2					22		22,9%
	Grade 3					37		38,5%

Overall mortality rate was 18.75% (18/96). A significant association was observed with increase age and mortality. Age of patients died in first year is higher than that are alive (p= 0.027). Mortality in first year was significantly higher in ASA grade 3 and 4 patients when compared with ASA grade 1-2 patients in both chi-square test(p=0.00) and univariate logistic regression test (OR: 0.285) (p=0.001) but this association does not exist in multivariate logistic regression .

No association was found between fracture type, time to theatre time, operation duration, PFN type, need for post operative intensive care (p>0.05), but blood transfusion is associated with high mortality (p= 0.026) (OR: 0.142). Blood transfusion in mortality group was 2.3 (+/- 2.7) while 1.2(+/-2) in alive group.

Mobility was inversely proportional with mortality. Although pre operative mobility levels does not associate

with mortality, loss of mobility level and post operative mobility was related with mortality (p= 0.00 and p=0.001 respectively). While one out of 59 patients with grade 2 and grade 3 mobility was died in first year, 17 out of 37 patients with grade 0 and grade 1 died in first year. Bone union time is also associate with mortality; while patients in alive group mean union time 11 weeks, union delayed to 15.5 weeks in exitus group.

While the investigation of patients' blood values none of the parameters are statistically associate with mortality except albumin levels. Serum albumin levels in exitus patients group was lower than that were alive group (p=0.04) (OR 4.359). (Table 2)

In univariate logistic regression model age, bone union time, ASA, loss of mobility level and postoperative mobility, serum albumin levels and blood transfusion in early postoperative period (three days from operation) needs were evaluated as risk factors for mortality and in multiple regression model blood transfusion levels and loss of mobility level were found to be an independent risk factors. (Table3)

Table 2. Evaluation of risk factors effecting mortality

		EX				Alive				p
		Mean.±s.d./n-%		Med		Mean.±s.d./n-%		Med		
Age		79,4	±	10,2	80	70,1	±	15,2	75	***0,027***
Operation duration		81,7	±	28,4	78	77,8	±	29,9	75	0,413
ASA		2,9	±	0,8	3	2,0	±	0,8	2	***0,000***
Loss of mobility level		2,1	±	0,7	2	0,5	±	0,7	0	***0,000***
Time to theatre		7,1	±	2,9	7	8,0	±	4,2	8	0,459
Union time		15,5	±	4,3	16	11,0	±	3,0	12	***0,001***
Blood transfusion		2,3	±	2,7	2	1,2	±	2,0	0	***0,026***
Hemoglobin		11,4	±	1,8	12	11,9	±	1,9	12	0,231
BUN		70,3	±	104,6	50	43,6	±	24,2	40	0,074
Creatinine		1,2	±	1,2	0,9	2,4	±	9,1	0,8	0,280
Mortality time		24,2	±	15,4	23,5					
Sodium		135,8	±	5,6	138	137,1	±	2,9	138	0,795
Potasium		4,1	±	0,6	4,0	4,3	±	0,6	4,1	0,311
Albumine		3,1	±	0,5	3,0	3,5	±	0,6	3,6	***0,004***
Side	**Right**	9		50,0%		27		34,6%		0,224
	Left	9		50,0%		51		65,4%		
AO/OTA	**31A1**	10		55,6%		33		42,3%		0,447
classification	**31A2**	5		27,8%		21		26,9%		
	31A3	3		16,7%		24		30,8%		
PFN	**Standart**	14		77,8%		67		85,9%		0,392
	Long	4		22,2%		11		14,1%		
Postoperative	**No**	13		72,2%		50		64,1%		0,513
intensive care	**Yes**	5		27,8%		28		35,9%		
Mobility before	**Grade 1**	0		0,0%		9		11,5%		0,712
fracture	**Grade 2**	3		16,7%		7		9,0%		
	Grade 3	15		83,3%		62		79,5%		
Mobility after	**Grade 0**	7		38,9%		5		6,4%		***0,001***
operation	**Grade 1**	10		55,6%		15		19,2%		
	Grade 2	0		0,0%		22		28,2%		
	Grade 3	1		5,6%		36		46,2%		

Table 3. Final model for regression analysis of risk factors

	Univariate Model				Multivariate Model			
	OR	95 % CI		p	OR	95 % CI		p
		Min	Max			Min	Max	
Age	0,946	0,903	0,991	***0,020***				
ASA	0,285	0,140	0,582	***0,001***				
Loss of mobility level	0,084	0,027	0,264	***0,000***	0,142	0,043	0,465	***0,001***
Blood transfusion	0,831	0,674	1,023	***0,081***				
Union time	0,657	0,516	0,837	***0,001***	0,751	0,589	0,957	***0,020***
Albumine	4,359	1,569	12,113	***0,005***				
Mobility after operation	2,442	1,227	4,862	***0,011***				

Discussion

The most important finding of our study was 18.75 mortality rate. Just like in our Turkey, hip fractures are second leading cause of hospitalization in elderly patients [1]. Overall incidence of intertrochanteric femur fractures increase all over the World [9] . Almost 10% of women and 5% of men older than 60 will sustain a hip fracture

during their remaining lifetime [10]. Although the knowledge increases about handling of these fractures, mortality is still high [11]. Different strategies are used for decreasing the mortality rate like early surgery, prolonged medical optimization or different rehabilitation protocols. Because of these different factors varied mortality rates could be found between %4.1 and %36 [12,13]. To predict risk factors of mortality different prediction models are used but still not a perfect model is achieved [3].

Total mortality rate was found 18.75% in our study. Systematic meta analysis show that overall mortality rate in hip fractures are nearly 25% and our result was compatible with literature [6]. Hommel et al. found total mortality rate 22% among women and 36% among men [13]. In their study they found that age, male gender and preoperative mobility was associated with increased mortality, but no significant association was found between delayed operation and mortality [13]. According to a meta analysis of 257367 patients, delayed operation was found associated with base line risk for mortality but this association was seen in young population with low risk ratio [4]. In elderly patients confusing data exists about hip fractures. Whenever delayed operation could be associated with decreased mortality due to optimization of patient with so many morbidities [12], on the other hand it could be also associated with increased mortality due to immobility [14]. Delayed surgery could also be associated with not only mortality but also increased risk of pneumonia and pressure sores [5]. Smektala et al. also emphasize that time to surgery does not decrease mortality in elderly patients but somewhat lowers the rates of complications due to immobility [15]. We found in patients that were operated after 72 hours, time to theatre is not related with mortality. In meta analysis of patients operated <24 , <48 and <72 hours a reduction of mortality was prominent but the main cut of point was 48 hours [5].

To many risk factors for mortality were evaluated in the literature. Age, male gender, and ASA scores are main topics that were agreed on. Age and ASA scores also found related with increased mortality in our study. Mortality rates dramatically increase in ASA grade 3-4 patients when compared to ASA grade 1-2 patients [16]. Different comorbidities evaluated like cardiac disease, diabetes, pneumonia or renal diseases etc. but ASA score is remains as a best predictor for overall health status and medical stability of the patients [17]. Mortality increase as the age of the patient increases. 85 years is a breaking point at increase of mortality [12].

As we evaluate routine blood test of patients during the first admission to the hospital after the fracture serum albumin levels were lower in the patients died in one year. Haemoglobin levels and serum creatinine, sodium and potassium levels were not associated with mortality. In the literature serum albumin levels, white blood cell count and creatinine levels, high plasma potassium and BUN levels were associate with mortality [18,19]. Gruson and colleagues emphasize in their study that low haemoglobin levels could be a predictor for poor outcome in hip fractures [20]. Although we couldn't find an association with haemoglobin levels, blood transfusion needs during surgery and early postoperative period was associate with mortality in univariate logistic regression but this association was not observed in multivariate model. While Carson et al. showed in their study that allogeneic blood transfusion had an effect on postoperative mortality [21]; Johnston et al found that allogenic blood transfusion was associated with neither mortality nor infection [22].

Most important finding of our study was association between mortality and mobility. Although pre operative mobility levels do not correlate with mortality, patients that cannot mobilized after operation had a tendency to death. Odds ratio for exitus was 2.442 for patients that can not properly mobilized after operation. Using walking aids before fracture period, lack of rehabilitation after operation were mortality predictors [6]. Immobility is a part of Virchow Triad and the only factor that can be corrected by health cares in elderly hip fractures. Post operative rehabilitation programs are designed to decrease mortality and independency [23]. Well organized rehabilitation program could block the Virchow Triad and decrease the risk of thrombosis. From these view early surgery could also be important factor just to mobilize patient quickly so as to decrease the mortality. Rehabilitation programs that based mainly on mobility had better outcomes than geriatric rehabilitation [23]. But regarding from rehabilitation protocol only %60 of the patients gain pre-fracture mobility in one year [24]. Also in our study independent mobility rate was 80.2% in pre-fracture period, while in post operative period this rate fall to 38.5%. Sener et al. found similar results in proximal femoral fractures that were treated by partial prosthesis [25]. In meta analysis any rehabilitation program that keeps patients walking around had positive effect on decreasing the postoperative co-morbidities and mortality [26]. Multidisciplinary in-patient rehabilitation programs tended to have better results than traditional methods for proximal femoral fractures [27].

Retrospective design and small number of patients were weak points of our study. Prospective designed high numbered studies are needed for evaluation of morbidity reasons. On the other hand including only intertrochanteric fractures and a applying proximal femoral nail as a standard treatment for these fractures makes our sample more homogenous.

During treatment of intertrochanteric fractures, ASA scores and blood transfusion needs are invariable factors for mortality. In postoperative period mobilization is the most important variable that we could change in intertrochanteric fractures to decrease mortality. Whatever the timing of operation, gaining the mobility as soon as possible should be the goal of our treatment.

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