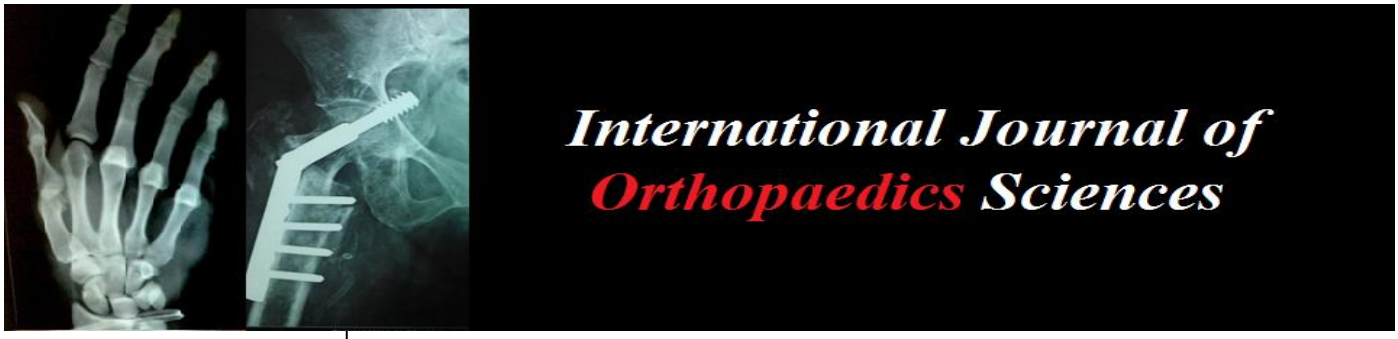

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Effect of age, sex, co morbidities, delay in surgery and complications on outcome in elderly with proximal femur fractures

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Abstract
Introduction: Intertrochanteric and femoral neck fractures account for nearly 90% of proximal femur fractures. It is customary to use 65 years of age to define the elderly. One year mortality in these elderly patients ranges from 12%-36%. The main objective of this prospective study is to study the effect of age, sex, co morbidities, delay in surgery and complications on outcome in elderly with proximal femur fractures and to identify optimal measures that can be taken to improve outcome in these patients. It was presumed that early surgery within 48 hours after stabilization of co morbid conditions improves outcome in these elderly patients with proximal femur fractures.
Materials and Methods: In this prospective study elderly patients with proximal femur fractures were selected, after careful selection with inclusion and exclusion criteria. They underwent surgery after preoperative assessment and followed for up to one year at a tertiary referral centre.
Results: Increasing age and male sex are not significant factors affecting outcome. Increasing number of co morbidities (2, 3 or more) is associated with significant increase in mean length of hospital stay (p values .006, and .001), increased incidence in number of complications (p value .008) and mortality (p value .028). Presence of complications is significantly associated with increase in mean length of hospital stay (p values .000, .001), decline in recovery of pre injury mobility status (p value 0.018), increased incidence in number of deaths (p value .01). Delay in surgery more than 48 hours is associated with significant increase in mean length of hospital stay (p value .001) and increased incidence in number of complications (p value .028).
Conclusion: Early surgery within 48 hours after stabilization of co morbid conditions is associated with improvement of outcome in elderly patients with proximal femur fractures is proved correct in terms of decreasing mean length of hospital stay and decreasing incidence of number of complications.

Keywords: Proximal femoral fractures, elderly, co-morbidities

Introduction

Fractures of proximal femur is divided in to (1) fractures of head of femur, (2) fractures of neck of femur (3) fractures of intertrochanteric area, (4) fractures of subtrochanter [1]. Intertrochanteric and femoral neck fractures account for nearly 90% of proximal femur fractures [2]. Incidence is more common in women than in men [1]. It is customary to use 65 years of age to define the elderly [3]. 1 year mortality in these elderly patients ranges from 12%-36% [3].

The time needed to perform a complete medical evaluation and treat or manage co morbidities in elderly patients can delay surgery for at least 12 to 24 hours [2]. Although there is conflicting evidence about mortality rate if surgery is delayed for 24 hours or less, there is substantial evidence suggesting that if surgery is postponed for more than three days, the mortality rate within first year after this treatment doubles [2]. Furthermore, prolonging the time before surgery increases the risk of skin breakdown, urinary tract infection, deep vein thrombosis, and pulmonary complications [2].

The main objective of this prospective study is to study the effect of age, sex, co morbidities, delay in surgery and complications on outcome in elderly with proximal femur fractures and to identify optimal measures that can be taken to improve outcome in these patients. It was

presumed that early surgery within 48 hours after stabilization of co morbid conditions improves outcome in these elderly patients with proximal femur fractures [4].

Materials and Methods

In this prospective study a total of 54 elderly patients with proximal femur fractures admitted to our institute from 02/2006 to 02/2008 were studied after ethical approval and patients consent with careful selection utilising the inclusion and exclusion criteria and followed for up to one year.

All patients were examined in a systematic way and routine preoperative investigations done. Pre anaesthetic assessment done and those who were unfit for surgery are treated conservatively and surgery was delayed when a patient requires evaluation and treatment for stabilization of medical co morbidities. Early surgery was defined as surgery on day of admission or following day. Surgery performed after this time was considered to be delayed [4]. Recovery of mobility status was assessed. Postoperative complications and deaths were noted as and when. Hospital length of stay was noted at the time of discharge. Patients were followed up at 3, 6 months and at one year.

Outcome assessed with

- Length of hospital stay
- Postoperative recovery of mobility
- Postoperative complications
- Mortality at one year

Inclusion criteria

- More than 65 years
- Normal cognition
- Independent living
- Ability to walk

Exclusion criteria

- Age below 65 years.
- Nonambulatory and dependent
- Cognitive dysfunction.
- Treated conservatively
- Poly trauma.
- Pathological fractures.
- Periprosthetic fractures.
- Implant failures and repeat surgeries.

Statistical methods: SPSS 15 for windows

Limitations: Four cases lost to follow up

Results

A total of 54 patients aged above 65 years were studied who underwent surgery for proximal femur fractures. Four cases were lost to follow up and excluded from study.

Table 1: Age distribution between male and females

Age (years)	Males (number)	Males (%)	Females (number)	Females (%)	total	(%)
65-69	5	13.9	2	11.1	7	13.0
70-79	9	25.0	8	44.4	17	31.5
80-89	18	50.0	7	38.9	25	46.3
≥ 90	4	11.1	1	5.6	5	9.3
	36	100.0	18	100.0	54	100.0

Mean age of male patient's is 78.97 years and mean age of female patient's is 77.33 years. There is no statistically significant difference (p value 0.526) in age distribution between males and females.

Table 2: Sex distribution of various fractures

Fracture level	Mals	(%)	Females	(%)	Total	(%)
Neck of femur	18	50.0	12	66.7	30	55.55
Trochanter	15	41.7	6	33.3	21	38.88
Sub trochanter	03	8.3	0	0	03	5.55

Table 3: Age distribution of various fractures

Fracture level	65-69y	70-79y	80-89y	≥ 90y	Total
Neck of femur	6 (20%)	9 (30%)	15 (50%)	0	30
Trochanter	1 (4.8%)	7 (33.3%)	9 (42.9%)	4 (19.0%)	21
Sub trochanter	0	1 (33.33%)	1 (33.33%)	1 (33.33%)	03

There is no statistical significant difference in age (p value .136) and sex (p value 0.314) distribution of various fractures.

Table 4: List of various surgeries done

Name of surgery	Number of Patients	%
Bipolar prosthesis replacement	19	35.2
Total hip replacement	11	20.4
Condylar plating	13	24.1
Dynamic hip screw	10	18.5
Valgus osteotomy	01	1.9

Table 5: groups according to number of co morbidities

Number of Co morbidities	Number of patients	%
0	20	37.0
1	12	22.2
2	12	22.2
≥ 3	10	18.6

Table 6: List of common co morbidities

Specific Co morbidity	Number of patients.	Number of co morbidities.	%
Hypertension	21	21	29.58
Diabetes	11	11	15.49
Respiratory disease	11	13	18.31
Cardio vascular disease	8	8	11.26
Anaemia	6	6	8.45
Renal disease	5	5	7.05
Osteoporosis	2	2	2.82
Others	5	5	7.05

Most common co morbidities were hypertension, respiratory diseases, diabetes mellitus, cardiovascular diseases, and anaemia.

Table 7: Causes of delay

Cause of delay.	Number of patients	Mean delay	Median delay	Range
Late presentation.	3	17	8	5-38
Active medical problems	4	9.75	9	4-17
Evaluation of health status	41	2.37	2	1-4
Poor general condition	6	5.83	5	4-10
Total	54	4.11		1-38

Delay was significantly high in patients with late presentation than in patients with delay for evaluation of health status (p value .000) and poor general condition (p value .001).
Delay was significantly high in patients with active medical problems than in patients with delay for evaluation of health status (p value .005).

Table 8: Delay in surgery groups

Delay group	Number of patients	(%)
<48 hours	23	42.6
> 48 hours	31	57.4

Mean number of days delay for surgery was 3.68 days.

Table 9: Mobility status

			Postsurgery mobility status		Total
			Mobile outside home	Mobile with in home	
Pre injury mobility status	Mobile outside home	Count % of total	43 82.7%	7 13.5%	50 96.2%
	Mobile with in home	Count % of total	0	2 3.8%	2 3.8%
Total		Count % of total	43 82.7%	9 17.3%	52 100%

Of the 54 patients nine (16.67%) had systemic complications and five (9.26%) had local complications following surgery.

Table 10: List of most common complications

Complications	Number of patients	Number of complications	(%)
Cardiac complications	3	5	31.25
Acute renal failure	2	2	12.5
Chest infection	2	2	12.5
Deep vein thrombosis	1	1	6.25
Urinary tract infection	1	1	6.25
Local complications	5	5	31.25
Total		16	100.0

Two (3.7%) patients died out of 54 patients at the end of first year. one patient died at four months following operation and another at six months following operation. Both died of myocardial infarction and heart failure.

Outcome assessment

Mean length of hospital stay

Table 11: Age and mean length of hospital stay

Age group	Mean length of hospital stay
65-69 years	18.00
70-79 years	16.12
80-89 years	16.80
≥ 90 years	21.20
Total	17.15

Increasing age is not a significant factor (p value 0.327) associated with increased mean length of hospital stay.

Table 12: Sex and mean length of hospital stay

Sex	Mean length of hospital stay
Male	17.63
Female	16.16

There is no significant difference (p value .364) between males and females.

Table 13: Number of Co morbidities& mean length of hospital stay

Number of Co morbidities	Number of patients	Mean length of hospital stay
0	20	13.85
1	12	16.33
2	12	19.83
≥ 3	10	21.50

Table 14: specific co morbidities and mean length of hospital stay

Specific Co morbidity	Mean length of hospital stay		P value
	With co morbidity	Without co morbidity	
Hypertension	19.66	15.55	.007
Diabetes	17.27	17.12	.935
Respiratory disease	22.36	15.81	.000
Cardio vascular disease	19.37	16.76	.223
Anaemia	23.16	16.40	.004
Renal disease	23	16.55	.012

Two, three or more co morbidities are significant groups (p values .006, and .001) for increased mean length of hospital stay compared to group with no co morbidities.

Respiratory disease, anaemia, hypertension and renal disease are associated with significantly increased mean length of hospital stay.

Table 15: cause of delay and mean length of hospital stay

Cause of delay	Number of patients	Mean length of hospital stay
Late presentation.	3	20
Active medical problems	4	22
Evaluation of health status	41	15.78
Poor general condition	6	21.83

Patients with poor general condition are associated with significant (p value .045) increase in mean length of hospital stay compared to patients with delay for evaluation of medical status.

Table 16: Delay group and mean length of hospital stay

Delay group	Mean length of hospital stay
< 48 hours	14.26
> 48 hours	19.29

Delay of more than 48 hours is a significant factor (.001) in increasing mean length of hospital stay.

Table 17: complications and mean length of hospital stay

Number of complications	Number of patients	Mean length of hospital stay
0	41	15.00
1	10	24.40
2	03	22.33

Complications (one, two) are associated with significant (p values .000, .001) increase in mean length of hospital stay compared to patients without complications.

Table 18: Number of co morbidities & mean length of hospital stay

Specific Complication	Mean length of hospital stay		P value
	With complications	Without complications	
Cardiac complications.	26.33	16.61	.002
Acute renal failure	22	16.96	.212
Chest infection	22.5	16.94	.168
Deep vein thrombosis	23	17.04	.292
Urinary tract infection	22	17.06	.384
Local complications	23.8	16.47	.004

Cardiac complications and local complications are associated with significant (p values .002, and .004) increase in mean length of hospital stay.

Postoperative recovery of mobility

Table 19: Age and decline in mobility status

Age	Number of patients	Number of patients with decline in mobility status	%
65-69 years	7	1	14.28
70-79 years	17	0	0
80-89 years	25	4	16
≥ 90 years	5	2	40.00

Increasing age is not a significant factor (pvalue.112).

Table 20: Sex and decline in mobility status

Sex	Number of patients	Number of patients with decline in mobility status	%
Male	36	6	16.66
Female	18	1	5.55

There is no significant difference (p value .252) between males and females.

Table 21: Number of co morbidities and decline in mobility status

Number of Co morbidities	Number of patients	Number of patients with decline in mobility status	%
0	20	1	5
1	12	1	8.33
2	12	4	33.33
≥ 3	10	1	10

Table 22: Specific co morbidities and decline in mobility status

Co morbidity	Number of patients.	Decline in mobility status (%)		P value
		With co morbidity	Without co morbidity	
Hypertension	21	02 (9.5)	5 (15.20)	0.548
Diabetes	11	02 (18.18)	5 (11.6)	.564
Respiratory disease	11	04 (36.36)	3 (7)	.01
Cardio vascular disease	8	01 (12.5)	6 (13)	.966
Anaemia	6	01 (16.66)	6 (12.5)	.775
Renal disease	5	01 (20.00)	6 (12.2)	.623

Number of co morbidities is not statistically significantly (p value .119) associated with decline in mobility status. Patients with respiratory disease are associated with significant decline in mobility status.

Table 23: Delay in surgery and decline in mobility status

Delay group	Number of patients	Number of patients with decline in mobility status	%
< 48 hours	23	1	4.34
> 48 hours	31	6	19.35

Delay is not a significant (p value .104) risk factor for decline in mobility status.

Table 24: cause of delay and decline in mobility statu^{s}

Cause of delay.	Number of patients	Number of patients with decline in mobility status	%
Late presentation.	3	1	33.33
Active medical problems	4	2	50
Evaluation of health status	41	3	6.81
Poor general condition	6	1	14.28

Cause of delay is not associated with significant (.066) decline in mobility status.

Table 25: Complications and decline in mobility status

Number of complications	Number of patients	Number of patients with decline in mobility status	(%)
0	41	3	7.31
1	10	4	40
2	03	0	0

Table 26: Specific complications and decline in mobility status

Specific Complication	Number of patients	Decline in mobility status (%)		P value
		With complication	Without complication	
Cardiac complications.	3	0	7 (13.7)	.492
Acute renal failure	2	0	7 (13.5)	.578
Chest infection	2	1 (50)	6 (11.5)	.112
Deep vein thrombosis	1	1 (100)	6 (11.3)	.009
UTI	1	1 (100)	6 (11.3)	.009
Local complications	5	1 (20)	6 (12.2)	.623

Presence of complication is associated with significant (p value 0.018) decline in mobility status. Surprisingly decline in mobility is low in patients with 2 complications probably because of high mortality. There is statistically significant decline in mobility status with deep vein thrombosis and urinary tract infection.

Risk factors for complications

Table 27: age and complications

Age groups	Number of patients	Number of patients with complications	%
65-69 years	7	1	14.28
70-79 years	17	4	23.52
80-89 years	25	6	24
≥ 90 years	5	2	40.0

Increasing age is not a significant (p value .786) factor for increasing the number of complications.

Table 28: sex and complications

Sex	Number of patients	Number of patients with complications	%
Male	36	9	25
Female	18	4	22.22

There is no significant difference between males and females (p value .822).

Table 29: co morbidities and complications

Co morbidities	Number of patients	Number of patients with complications	%
0	20	1	5
1	12	2	16.7
2	12	4	33.3
≥ 3	10	6	60

Table 30: Specific co morbidities and complications

Specific Co morbidity	Number of patients	Number of patients with complications (%)		
		With co morbidity	Without co morbidity	P value
Hypertension	21	8 (38.1)	5 (15.2)	.055
Diabetes	11	3 (27.3)	10 (23.3)	.781
Respiratory disease	11	5 (45.5)	8 (18.6)	.063
Cardio vascular disease	8	3 (37.5)	10 (21.7)	.336
Anaemia	6	4 (66.7)	9 (18.8)	.01
Renal disease	5	5 (100)	8 (16.3)	.000

Increasing number of co morbidities is a significant factor (p value .008) for being predisposed to postoperative complications. Patients with specific co morbidities like renal disease, and anaemia had significantly (p values .000 and.01) high incidence of complications.

Table 31: Delay and complications

Delay group	Number of patients	Number of patients with complications	%
< 48hours	23	2	8.7
>48 hours	31	11	35.5

Table 32: Cause of delay and complications

Cause of delay	Number of patients	Number of patients with complications	%
Late presentation.	3	1	33.3
Active medical problems	4	1	25
Evaluation of health status	41	8	19.5
Poor general condition	6	3	50.0

Delay more than 48 hours is a significant factor (p value .028) for predisposing to postoperative complications. Cause of delay not associated with (p value .199) significant increase in number of complications.

Mortality

Mortality at one year is two (3.70 %) out of 54patients.

Table 33: Age and mortality

Age	Number of patients	Mortality at 1year	Percentage of mortality
65-69 years	7	0	0
70-79 years	17	0	0
80-89 years	25	1	4
≥ 90 years	5	1	20

Increasing age is not a significant factor for increased mortality (p value .199).

Table 34: Sex and mortality

Sex	Number of patients	Mortality at 1 year	Percentage of mortality
Male	36	2	5.6
Female	18	0	0

There is no significant difference between males and females (p value .071).

Table 35: Number of co morbidities and mortality

Number of Co morbidities	Number of patients	Mortality at 1 year	Percentage of mortality
0	20	0	0
1	12	0	0
2	12	0	0
≥ 3	10	2	20.0

Increase in number of co morbid conditions is associated with significant (p value .028) increase in mortality

Table 36: Specific co morbidities and mortality

Specific Co morbidity	Number of patients.	Mortality at 1 year (%) (co morbidity)		P value
		(Yes)	(No)	
Hypertension	21	2 (9.52)	0	.071
Diabetes	11	0	2 (4.7)	.466
Respiratory disease	11	1 (9.09)	1 (2.3)	.289
Cardio vascular disease	8	2 (25.0)	0	.001
Anaemia	6	1 (16.66)	1 (2.1)	.075
Renal disease	5	1 (20.0)	1 (2)	.043
Osteoporosis	2	0	2 (3.7)	.777

There is statistically significantly increased mortality with specific co morbidities like cardio vascular diseases, and renal disease.

Delay group	Number of patients	Mortality at one year	Percentage of mortality
< 48 hours	23	0	0
> 48 hours	31	2	6.5

Table 37: Cause of delay and mortality

Cause of delay.	Number of patients	Mortality at 1 year	Percentage of mortality
Late presentation.	3	0	0
Active medical problems	4	0	0
Evaluation of health status	41	2	4.87
Poor general condition	6	0	0

Delay of more than 48 hours is not a significant (p value .214) factor for increased mortality. Cause of delay also not significant predictor of mortality (p value .883).

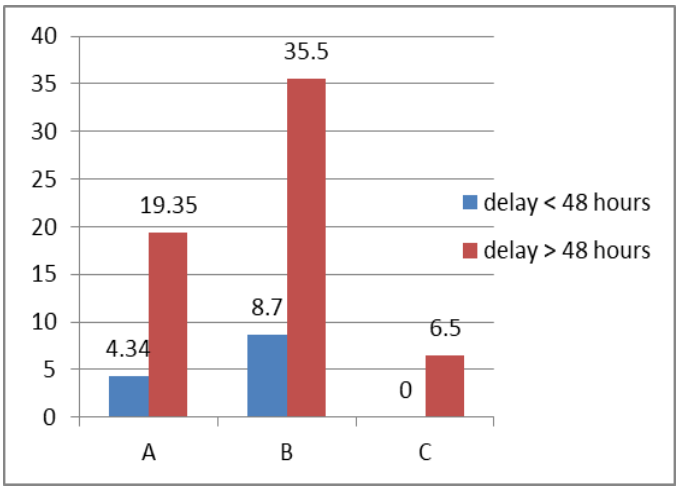
Table 38: Complications and mortality

Number of complications	Number of patients	Mortality at 1 year	Percentage of mortality
0	41	0	0
1	10	0	0
2	03	2	100

Table 39: Specific complication and mortality

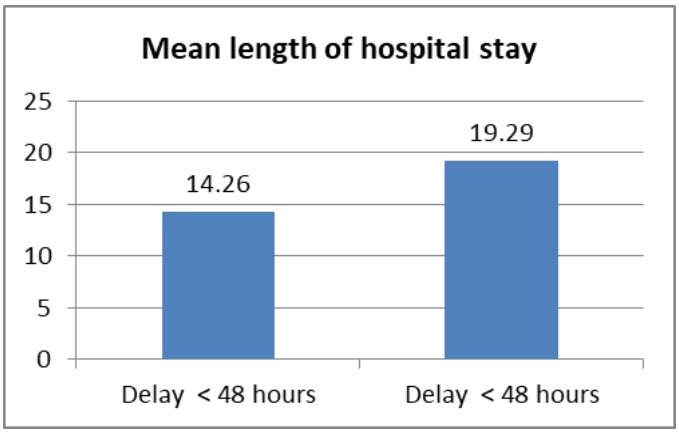
Specific Complication	Number of patients	Mortality at 1 year (%) (complications)		P value
		yes	no	
Cardiac complications.	3	2 (66.7)	0	.000
Acute renal failure	2	0	2 (3.8)	.777
Chest infection	2	0	2 (3.8)	.777
Deep vein thrombosis	1	0	2 (3.8)	.843
UTI	1	0	2 (3.8)	.843
Local complications	5	0	2 (4.1)	.645

Presence of complications and cardiac complications in specific are associated with significantly (p values .01, and .000) high mortality.



Graph showing relation of various outcomes and delay in surgery

A. Percentage of patients with decline in mobility status
B. Percentage of patients who developed complications
C. Percentage of patients with mortality



Graph showing Mean length of hospital stay and delay in surgery

Discussion

In one study 8.9% were more than 90years and 79.7 years was the mean patient's age [5]. While mean age of patients in our study is 78.42 years and five out of 54 patients (9.25%) were ≥ 90 years.

Three studies show high incidence in female patients [1, 2, 6]. My study shows contrasting results of high incidence in males 36 (66.66%) for reasons not known.

In one study [6] age distribution between males and females did not show significant difference (p value 0.53) which is comparable to my study (p value0.526).

In two studies distribution of various fractures in different age groups did not show significant difference [7, 8]. My study results are comparable with these studies.

In one prospective study 41%, 35%, 17% and 7% had no, one, two, three or more co morbidities respectively[9]. While in my study 37%, 22.2%, 22.2% and 18.6% had no, one, two, three or more co morbidities respectively.

The most common co morbidities in one prospectively study are cardiovascular disease (24%) and chronic obstructive airways disease (14%) [9]. While in my study hypertension (29.58%) and diabetes mellitus (15.49%) are the most common co morbidities.

In one study mortality rate was 33% at one year and 20% had complications [9]. While in my study 3.7% had mortality and 24% had complications.

One study shows significant increase in risk of complications with increasing number of co morbidities and increasing age [7]. Same study shows no significant association with specific co morbidities and delay in surgery [7]. While my study shows significant association with all except increasing age.

One study shows significant increase in length of hospital stay, decline in mobility level and increase in mortality with increasing age [5]. While my study shows no significant association.

One study [8] shows no significant recovery of mobility status, significant increase in complications and mortality in men while my study shows no significant association in outcome with either sex.

One study shows significant increase in mortality with three or more co morbidities and with specific complications like respiratory diseases and renal disease [9]. While my study shows significant increase in mortality with three or more co morbidities and with specific complications like cardiovascular diseases and renal disease.

One prospective study and one retrospective study showed significant increase in length of hospital stay in patients with delay in surgery [10, 11]. One prospective study and one retrospective study showed significant increase in complications with delay in surgery [12, 11]. My study results are similar to these studies.

One study shows significant increase in mortality with delay more than four days[4]. While my study shows no significant increase in mortality with delay more than 48 hours when compared to early surgery less than 48 hours.

Eight studies [13, 14, 4, 15, 16, 17, 18, 19] showed an increase in mortality with delay in surgery while three [11, 20, 12] studies showed no difference. My study shows no significant association of delay in surgery with mortality. However there were no studies showing effect on recovery of pre injury mobility.

One study shows significant increase in length of hospital stay and no significant decline in pre injury mobility with postoperative complications [7]. While my study shows both significant increase in length of hospital stay and significant decline in pre injury mobility status with complications.

One study shows significant increase in mortality with both cardiac and pulmonary complications [6]. While my study shows significant increase in mortality only with cardiac complications.

Conclusion

Delay in surgery more than 48 hours is associated with significant increase in mean length of hospital stay and increased incidence in number of complications.

Thus our hypothesis early surgery within 48 hours after stabilization of co morbid conditions is associated with improvement of outcome in elderly patients with proximal femur fractures is proved correct in terms of decreasing mean length of hospital stay and decreasing incidence of number of complications but is not proved in terms of recovery of pre injury mobility status and decreasing mortality rate.

We conclude that early surgery within 48 hours after stabilization of co morbid conditions improves outcome in elderly with proximal femur fractures.

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