Mortality and ambulatory status after intertrochanteric fracture treated at Maharat Nakhon Ratchasima Hospital, Thailand

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Purpose: *1. To assess elderly intertrochanteric fracture patients for overall one-year mortality rate and for ambulatory ability two years after treatment.*

2. To analyze factors that may affect one-year mortality and independent walking.

3. To compare one-year mortality, survival function, and independent walking between operative and home skin traction treatment.

Methods: *A retrospective cohort study of 496 intertrochanteric fracture patients at least 60 years of age, treated at Maharat Nakhon Ratchasima Hospital between October 2002 and September 2006, assessed one-year mortality rate and two-year ambulatory ability. The factors studied were treatment methods (251 operation, 245 home skin traction), gender (337 female, 159 male), age (mean 78 years, SD8.7), numbers of comorbidities (57% had one or more comorbidities), and ASA classification (ASA I, II, III, and IV were 55%, 36.7%, 7.5%, and 0.8% respectively).*

Results: *The overall one-year mortality rate was 23.6%. The median survival time was 4.18 years after fracture. Of patients who were still alive two years later, 55.2% could walk independently, 27.7% needed assistance or gait aids, and 17.1% were confined to bed or wheelchair. Factors that significantly affected one-year mortality were nonoperative treatment, being male, and each additional year of age. The home traction group had a higher one-year mortality rate than the operative group (odds ratio 3.01; 95 % CI 1.8634, 4.8997 P 0.000). Independent walking depended on type of treatment only. The operative group had more independent walking (odds ratio 2.19; 95% CI 1.3009, 3.6917 P 0.003). Gender, age, numbers of comorbidities, and ASA class did not affect independent walking.*

Conclusion: *Intertrochanteric fracture in the elderly is a terrible condition with a very high risk of one-year mortality and later dependence. Operative internal fixation is the treatment of choice, with a lower one-year mortality rate and more independent walking.*

Keywords: *Elderly intertrochanteric fracture, one-year mortality, ambulatory ability, independent walking, home skin traction*

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Intertrochanteric fracture is the most common hip fracture in the elderly. It poses a major threat to survival and has a tremendous impact on both the health care system and society in general. More than 250,000 hip fractures occur in the United States each year and this number is projected to double by the year 2050[1]. The number of patients expected to increase exponentially over the next 50 years as a result of increased life expectancy and population growth.

In Maharat Nakhon Ratchasima Hospital, the number of intertrochanteric fracture patients has more than doubled over the past five years. Despite marked improvement in implant design, surgical technique, and patient care, about half of our patients still refuse surgery. Age is a major factor; operations are more common in the 60-79 age group but home skin traction is more common in patients ≥80 years old and in some high risk cases. The home skin traction program was developed to reduce hospital stays for elderly patients who refused operations and some high risk cases at Maharat Nakhon Ratchasima Hospital in 2002, yet no study has been done before to compare its final results with those of operative treatment.

The overall one-year mortality rate in previous studies has ranged from 8.8-51%[2,3,4,5,6,7,8]. This wide variation may be caused by different patient characteristics and treatment methods. In

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addition, many factors such as age, gender, ASA classification, operative or non operative treatment, walking ability, dementia, and type of surgery have been reported as predictive factors for one-year mortality and ambulatory ability[4,7,11,12,14,17].

Objectives

To assess overall one-year mortality rate and ambulatory ability, and to analyze factors that may affect one-year mortality, independent walking after surgery, and home traction treatment of elderly intertrochanteric fracture patients.

Material and Method

A retrospective cohort study analyzed all Thai intertrochanteric fracture patients aged 60 and over who were treated at Maharat Nakhon Ratchasima Hospital between October 2002 and September 2006. Malignancy with pathological fracture, associated severe head injury, paraplegia, or prior non ambulatory cases were excluded. Type of treatment was decided by the orthopedic surgeon in charge of the patient after discussion of the treatment options and risks. Operative cases were mostly fixed by dynamic hip screw. Most home skin traction cases were chosen by the patient and/or family. Patients and family were trained in a precise home care program before discharge to prevent complications. A trained patient care unit team and home health care coordinator periodically visited the patients at home after discharge to check the traction and complications.

Mortality rate and survival status were checked by the Thailand Civil Registration Office. All patients were followed up to assess mortality within one year. Ambulatory status was evaluated after at least two years using medical records, home health care records, and questionnaires. Of 315 patients who were still alive two years after treatment, 252 (80%) were contacted to assess ambulatory ability. Ambulatory status was classified into three levels: independent walking without gait aid, with gait aids or needing help from assistant, confined to wheelchair or bed.

Descriptive analysis, chi-square, and t-test were used to compare demographic data. Logistic regression analysis with 95% confidence level was used to determine the definite results affecting one-year mortality and independent walking after controlling for confounders: type of treatment, gender, age, comorbidity numbers, and ASA class. Kaplan-Meier survival estimate graph was performed to compare survival functions between the two types of treatment in the age groups 60-79 years and ≥80 years.

Each author certifies that this study was ethically permitted by the Research Center of Maharat Nakhon Ratchasima Hospital. No funds or commercial support were received that might pose a conflict of interest with the submitted article.

Results

Demographic data from 496 patients who met the eligibility criteria are summarized in Table 1. There were 337 females and 159 males, aged between 60 to 99 years (mean 78 years, SD 8.7). The mean age of the home traction group was slightly higher than that of the operative group, especially in extreme elderly patients (80-99 years). Surgery was used to treat 251 patients (63% of these from age group 60- 79 years), and 245 patients were treated with home traction program (61% from age group ≥ 80 years). Male patients were more likely to undergo surgery (97 patients) than home traction (62 patients). Female patients were the opposite, with 183 treated by home traction and 154 receiving surgery. This may have been because female patients had a higher average age (female 79.2 years, SD 8.27 versus male 75.5 years, SD 8.98). Falls were the main cause of fractures (90.7%).

Table 1. Demographic Data

Characteristics	Total		Operative treatment		Home traction	
	Cases (n=496)	%	Cases (n=251)	%	Cases (n=245)	%
Gender						
Male	159	32.1	97	38.6	62	25.3
Female	337	67.9	154	61.4	183	74.7
Age group						
60-79 yrs (mean / SD)	255 (71.2 / 5.96)	51.4	159 (70.7 / 5.22)	63.3	96 (71.6 / 5.78)	39.2
80-99 yrs (mean / SD)	241 (85.1 / 3.62)	48.6	92 (84.4 / 3.78)	36.7	149 (86.1 / 3.91)	60.8
Causes of injury						
Fall	450	90.7	220	87.6	230	93.9
Traffic	46	9.3	31	12.4	15	6.1
Numbers of comorbidities						
0 comorbidity	213	42.9	116	46.2	97	39.6
1 comorbidity	168	33.9	84	33.5	84	34.3

≥2 comorbidities	115	23.2	51	20.3	64	26.1
ASA class						
I	273	55.0	137	54.6	136	55.5
II	182	36.7	96	38.2	86	35.1
III	37	7.5	18	7.2	19	7.8
IV	4	0.8	0	0	4	1.6
V	0	0	0	0	0	0

Numbers of comorbidities did not correlate with higher ages: 213 cases (42.9%) had no comorbidity and an average age of 78.9 years SD 8.67, 168 cases (33.9%) had one comorbidity and an average age of 77.7 years SD 8.67, and 115 cases (23.2%) had two or more comorbidities and an average age of 76.9 years SD 8.55. Types of comorbidities are summarized in Table 2.

Table 2. Types of comorbidities

Comorbidities	Total	Operative	Home traction	P-value
Hypertension	115	53	62	0.34
D.M.	55	22	33	0.10
Cardiac disease	44	13	33	0.08
Anemia	60	30	30	0.92
Chronic kidney disease	29	10	19	0.07
Brain (Senile dementia, Alcohol withdrawal dementia, Alzheimer)	39	17	22	0.26
Recovery stage of CVA	21	11	10	0.86
COPD	11	6	5	0.79
Pulmonary tuberculosis	13	6	7	0.74
Others (Gout, Thyroid disease, Adrenal insufficiency)	12	7	5	0.81

Hypertension was the most common comorbidity (115 cases, 23.2%). Anemia and diabetes mellitus were found in 60 cases (12.1%) and 55 cases (11.1%) respectively. Patients with heart disease and chronic kidney disease were more likely to be treated by home skin traction but the differences were not statistically significant. Patients' American Society of Anesthesiologists classes were ASA I (55%), ASA II (36.7%), ASA III (7.5%), and ASA IV (0.8%). ASA classes of the two treatment methods were not significantly different.

Patient deaths within 30 days, 6 months, 1 year, and 2 years were 35 (7%), 96 (19.4%), 117 (23.6%), and 181 (36.5%), respectively. The overall one-year mortality rate was 23.6%. Of 117 cases that died within one year, 34 cases (6.9%) were from the operative group and 83 cases (16.7%) were from the home traction group. Advanced age and medical complications, especially pneumonia and sepsis, were common causes of death within one year. The logistic regression analysis in Table 3 shows that one-year mortality was affected by type of treatment, age, and gender. Number of comorbidities and ASA classification did not affect one-year mortality. One-year mortality was significantly higher in the home traction group, with an odds ratio of 3.01 (95% CI 1.8634, 4.8997 P 0.000). Females had lower mortality than males, with an odds of ratio 0.48 (95% CI 0.2951, 0.7720 P 0.003). Each year of increase in age increased the one-year mortality rate, with an odds ratio of 1.05 (95% CI 1.0211, 1.0802 P 0.001).

Table 3. Logistic regression analysis: one-year mortality

One-year mortality	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Treatment (Traction vs. operation)	3.008037	.7349245	4.51	0.000	1.863449	4.855668
Age (Per year of increase)	1.050238	.0150515	3.42	0.001	1.021148	1.080157
Gender (Female vs. male)	.4773206	.1171033	-3.01	0.003	.295108	.7720393
Comorbidity_1 (1 vs. 0 comorbidity)	.6860776	.185211	-1.40	0.163	.4041904	1.164556

Comorbidity_2 (2 vs. 0 comorbidity)	1.114211	.313868	0.38	0.701	.641487	1.935294
ASA_2 (ASA II vs. ASA I)	.7560351	.1843665	-1.15	0.251	.468779	1.219315
ASA_3 (ASA III vs. ASA I)	.9235145	.3919707	-0.19	0.851	.4019436	2.121887
ASA_4 (ASA IV vs. ASA I)	.7391473	.8835461	-0.25	0.800	.070997	7.695239

Figures 1 and 2 show the Kaplan-Meier survival estimate graphs for the 60-79 age group and the ≥80 age group. The overall median survival time was 4.18 years. Survival function of the operative group was significantly different from the home traction treatment in both age groups (P=0.001).

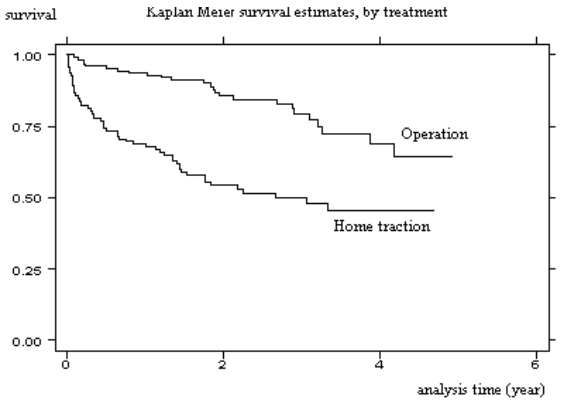

Fig.1 Kaplan-Meier survival estimates of age 60-79 years for the operation and home traction groups with the analysis time in years

Of 315 patients who were still alive after two years, 252 cases (80%) were contacted to evaluate their ambulatory status: 139 cases (55.2%) could walk independently, 70 cases (27.7%) needed assistance or gait aids, and 43 cases (17.1%) were restricted to bed or wheelchair. Logistic regression analysis showed that the only factor that influenced independent walking was treatment type. Age, gender, number of comorbidities, and ASA class had no effect. The operative group had significantly more independent walking than the home traction group with a relative odds ratio of 2.19 (95% CI 1.300976 to 3.691752, p 0.003).

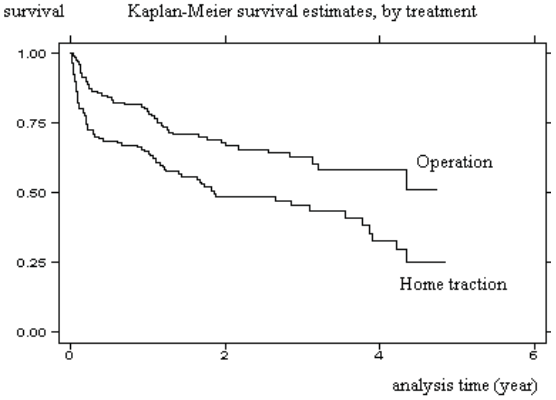

Fig.2 Kaplan-Meier survival estimates of age ≥80 years for the operation and home traction groups with the analysis time in years

Table 7. Logistic regression analysis: independent walking

Independent walking	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Treatment (operation vs. traction)	2.191547	.5831114	2.95	0.003	1.300976	3.691752
Age (per year of increase)	.9998464	.0071175	-0.02	0.983	.9859932	1.013894
Gender (female vs. male)	.7650124	.2184288	-0.94	0.348	.4371502	1.338771
Comorbidity_1 (1 vs. 0 comorbidity)	.6769533	.1996744	-1.32	0.186	.3797414	1.206784
Comorbidity_2 (2 vs. 0 comorbidity)	1.379513	.4919304	0.90	0.367	.6857875	2.774992
ASA_2 (ASA II vs. ASA I)	.9703464	.2661817	-0.11	0.913	.5667982	1.661212
ASA_3 (ASA III vs. ASA I)	.5755471	.3205386	-0.99	0.321	.1932068	1.714507

Discussion

The overall one-year mortality rate of intertrochanteric fracture patients in previous studies ranges from 8.8-51%[2,3,4,5,6,7,8]; in this study it was 23.6%. The variation may depend on patient characteristics such as age distribution, life expectancy, gender, race, bone character, osteoporosis, malnutrition, dementia, method of treatment, or other dependent factors which vary between countries. The one-year mortality rate may be used as baseline data for each hospital to further improve its treatment quality.

In the current study, causes of death within one year were commonly associated with advanced age and medical complications, especially pneumonia and sepsis. Half of the patients who died from pneumonia had no prior comorbidities. Two cases with underlying COPD died from pneumonia.

The one-year mortality rate of the general elderly population of Nakhon Ratchasima province was 4.23%. Therefore, the one-year mortality rate of intertrochanteric fracture patients in our study was 5.6 times more than that of the general population in the same age group. In addition, the second year mortality rate in this study was still high (16.9%), about 4 times that of the general population in the same age group. These results differ from those of Chapman MW[9] who reported that one year after a hip fracture, the life expectancy of the patient returns to the normal value for the age group.

Predictive factors for one-year mortality from our logistic regression analysis were age, gender, and method of treatment, which matches other reports[4,7,11,12,14]. There was no relationship between the number of comorbidities and the one-year mortality rate, so this is not a valid reason to opt against surgery. Due to the small numbers of ASA III and ASA IV patients in this study, it was difficult to conclude that ASA classification is a strong predictor of mortality, as has been found in previous studies[14,17].

Previous literature comparing mortality and ambulatory status between elderly operative and nonoperative intertrochanteric fracture patients has proven inconclusive. Cochrane's review in 2007[5,10] showed no significant difference in mortality at six months after two treatments. Hornby *et al.*[4] found no difference between AO DHS and skeletal tibial traction. Bong SC *et al.*[12] concluded that nonoperative treatment can be as successful as surgery, provided a high standard of nursing care is maintained. Gong *et al.*[2] found that only nonoperative traction at home decreased the one-year mortality rate, to 8.8%. Ooi *et al.*[11] found lower complications and one-year mortality rate with better ambulatory status after operative treatment. Basinski *et al.*[13] found no significant difference in mortality between early mobilization conservative treatment and surgery.

Ishida Yoichiro *et al.*[15] concluded that operative internal fixation is the treatment of choice for extremely elderly patients with intertrochanteric fracture: early mobilization avoids some complications of recumbency such as pneumonia, urinary tract infection, and pressure sores; functional activity provides the best survival rate after injury; the mortality rate usually increases between six months and one year after non-operative treatment; definitely poor outcomes of nonoperative treatment include varus deformity, leg shortening, and decreased recovery of walking ability, independent ambulation, and prefracture ability.

The current study shows that surgery leads to better results in both mortality and independent walking, despite the shorter mean length of hospital stay in the nonoperative traction group (12.39 vs. 17.52 days). Nonoperative patients need continued and effective intervention by a completely active home health care team to decrease adverse effects, besides which the main objective of treatment is not a shorter hospital stay. The primary objective is to decrease complications from a prolonged period in bed, e.g. pneumonia, urinary tract infection, bed sores, and sepsis.

Walking ability declined significantly during the first year after discharge, but thereafter reached a plateau[14]. Roughly half could walk independently and only one-third fully regained their prefracture level of function[17]. Advanced age, dementia, prefracture walking ability, extracapsular fractures, and number of prevalent vertebral fractures have been reported in other studies as factors affecting recovery of walking ability[7,14,15,16]. The current study seems to indicate that ambulatory ability declines with age. Independent walking was found in 67.8% of patients aged 60-79 and 49.2% of patients aged 80 and above. However, by logistic regression analysis, age was not a statistically significant factor affecting independent walking. Also, ambulatory ability seemed better in males than in females, but logistic regression analysis showed that independent walking had no statistically significant dependence on gender. Number of comorbidities and ASA class also did not influence independent walking. Only operative treatment was significantly more beneficial than home traction to independent walking. These results are similar to previous studies[11,14].

However, there were seven implant failures due to severe osteoporosis, biomechanical complexity of the fracture, inappropriate implant, and surgical technique. Follow-up procedures were necessary in those cases.

In the mortality cases, there were some

limitations in prefracture walking ability data and some losses of post-fracture walking ability. The correlation of mortality rate with ambulation ability in this study could not be analyzed. The other limitation of this study was that bone mineral density was only measured in a few cases, and there were no records of the prevalence of vertebral fractures on admission. These factors could not be analyzed as predictive factors affecting mortality and ambulatory ability.

The average life expectancy at birth of Thai people is 69.9 years in males and 77.6 years in females. As a result, many elderly patients stated that they were old enough and had lived long enough, and refused surgery even after meticulous explanation and discussion of surgery's safety and benefits. Information from this study should prove helpful in such instances.

Nevertheless, many nonoperative treatment patients should not be ignored. More effective education, information, and guidelines for patients and family are needed to prevent complications, and to decrease morbidity and mortality. A developed comprehensive coordinated multidisciplinary team (Primary Care Unit and Home Health Care Coordinator Center) may reduce morbidity and mortality.

Early mobilization is another treatment of choice that can decrease mortality rates and minimize the prolonged recumbence complications[13]. Patients and families should be told to expect about 2-3 months of pain, malpositioning, and decreased quality of ambulation, which may be acceptable in some extremely elderly patients.

Another important problem to address is refracturing the hip or injuring the other hip after adequate treatment. The patient's personal practice and environment must be prepared to prevent another fall with its subsequent difficulties in management and complications.

An advantage of this study is its large number of patient follow-ups. This study can be used as a reference for both operative and nonoperative treatments in government hospitals in northeast Thailand. There are many reasons for a surgeon to urge operative treatment, for the benefit of both elderly patients and their families, but the surgeon should emphasize that patient benefits come first.

Conclusion

Intertrochanteric fracture in the elderly is a terrible condition with a very high risk of one-year mortality and later dependence. The one-year mortality rate of patients treated at Maharat Nakhon Ratchasima Hospital was 23.6%, and 55.25% of patients who survived at least two years after the fracture could walk independently. Factors that significantly affected one-year mortality were nonoperative treatment, being male, and each additional year of age. Type of treatment was the only factor that influenced independent walking. Operative internal fixation is the treatment of choice, with a lower one-year mortality rate and a higher rate of independent walking.

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อัตราตายและสภาพการเดินของผู้สูงอายุที่มีกระดูกสะโพกหักผ่านบริเวณ intertrochanter ซึ่งได้รับการรักษาในโรงพยาบาลมหาราชนครราชสีมา

ศุภมาส ลิ่วศิริรัตน์, พบ., พาชิน ถนอมสิงห์, พบ.

การศึกษาย้อนหลังเพื่อติดตามอัตราตายภายใน 1 ปี และความสามารถในการเดินของผู้สูงอายุที่มีกระดูกสะโพกหักผ่านบริเวณ intertrochanter โดยคำนึงถึงปัจจัย วิธีการรักษา อายุ เพศ จำนวนโรคร่วม และ ASA classification ผู้ป่วยทั้งหมด 496 ราย เป็นหญิง 337 ราย ชาย 159 ราย อายุเฉลี่ย 78 ปี ได้รับรักษาโดยวิธีผ่าตัด 251 ราย วิธีไม่ผ่าตัด 245 ราย ผลการศึกษาพบว่าอัตราตายภายใน 1 ปี เท่ากับร้อยละ 23.6 ปัจจัยที่มีผลต่ออัตราตายได้แก่ วิธีการรักษา เพศ และอายุ การรักษาโดยวิธีไม่ผ่าตัดมีอัตราตายภายใน 1 ปี สูงกว่าอย่างมีนัยสำคัญ odds ratio 3.01 (95%CI 1.8634, 4.8997 P 0.000) เพศชายมีอัตราตายภายใน 1 ปีสูงกว่าเพศหญิง จำนวนโรคร่วมไม่มีผลต่ออัตราตายภายใน 1 ปี หากผู้ป่วยยังมีชีวิตอยู่ 2 ปีหลังการรักษา พบว่าร้อยละ 55.2 สามารถเดินได้อย่างอิสระร้อยละ 27.6 เดินได้โดยใช้อุปกรณ์หรือคนช่วยพยุง ร้อยละ17.1 ต้องนั่งรถเข็นหรือนอน ผู้ป่วยที่รักษาโดยวิธีผ่าตัดสามารถเดินได้อย่างอิสระมากกว่าวิธีไม่ผ่าตัดอย่างมีนัยสำคัญ odds ratio 2.19 (95%CI 1.3009, 3.691 P 0.003) การรักษาโดยวิธีผ่าตัดมีข้อดีกว่าเมื่อคำนึงถึงอัตราตายภายใน 1 ปี และความสามารถในการเดิน จึงควรใช้เป็นวิธีการรักษาหลักในผู้ป่วยสูงอายุที่มีกระดูกสะโพกหักผ่านบริเวณ intertrochanter