HEALTH-RELATED QUALITY OF LIFE AFTER HIP FRACTURE IN THE ELDERLY COMMUNITY-DWELLING

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Abstract. Hip fracture occurs commonly in older individuals and can have a considerable impact on the functional independence and quality of life for older patients living in the community. In a population-based case-control study six months after hip fracture, we investigated the association between functionality and quality of life. The Functional Independence Measure (FIM), the Frenchay Activities of Daily Living Index (FAI), and the Berg Balance Scale (BBS) were used to measure physical function, and quality of life was measured by completing a Short Form-36 (SF-36). With age and gender match, the hip fracture group scores were significantly lower ($p \leq 0.05$) than the control group in all measurements of physical function (FIM 95.54 *vs* 103.5; FAI 23.68 *vs* 30.76; BBS 46.21 *vs* 54.25). The quality of life was assessed by SF-36, which has eight domains: physical function, physical role, bodily pain, mental health, emotional role, social function, general health and vitality. All eight domains were significantly lower in the hip fracture group compared with the controls ($p<0.05$). The reduction in function was reflected in a reduction in the quality of life. Thus, clinically reported hip fracture impairs both the functionality and quality of life of these subjects. The adverse impact of hip fracture on quality of life and functionality needs to be recognized by health personnel in the community, so that adequate health resources can be devoted to preventing and treating this debilitating condition.

INTRODUCTION

Hip fractures are a major cause of morbidity and mortality in older people, and almost all occur after a fall (Murray and Lopez, 1996; Kannus *et al*, 1997; Boonyaratavej *et al*, 2001). An important finding from the national health survey in Thailand was the high incidence of falls in the old age group (Working Group in Thailand 1995). Previous studies have indicated that advanced age is associated with increased mortality rates and poorer functional recovery after hip fracture (Mossey *et al*, 1989; Barangan, 1990; Magaziner *et al*, 1990). However, the impact of hip fracture on quality of life is not well established, even though it is believed that physical, psychological and social functions are affected to varying degrees (Wolinsky *et al*, 1997). Many previous studies (Sernbo and Johnell, 1993; Thorngren *et al*, 1993; Murray and Lopez, 1996; Young *et al*, 1997) have noted a marked impact upon the functional and social independence of patients following hip fracture. The majority of these studies have followed patients after hip fracture, but have not included a control group of non-fracture participants.

This study was performed to assess the quality of life (QOL) and functional independence after hip fracture, as compared with a population of the same age in community dwellers of both sexes without hip fracture.

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MATERIALS AND METHODS

Subjects

In the case-control study, subjects with a first hip fracture (cases patients) were compared with controls (without hip fracture). The subjects and controls were recruited between April 2000 and August 2000. All subjects had to be living in the community within the central region of Thailand, aged 50 years and older.

Selection of cases

This requirement therefore excluded subjects who had severe debilitating symptoms. No patient had major medical comorbidities that would

make assessment of motor function impossible. Inclusion criteria for the hip fracture group included having a traumatic primary non-pathological hip fracture with no fracture, major reconstructive or replacement surgery to the other hip or to either knee and with a score ≥10/13 on an abbreviated mental test score (Folstein *et al*, 1975). A letter was sent to all hip fracture patients who fulfilled the inclusion criteria at 6-10 months post-fracture, inviting them to participate. Non-responders were telephoned to enhance recruitment. The control group was age- and gender- matched to the hip-fracture group. Control subjects had not had a fracture, major reconstructive or replacement surgery to either their hip or knees. They were recruited through various community groups for older adults and via media appeal.

Assessment of functionality

The instruments utilized to measure various aspects of functionality included the Functional Independence Measurement (FIM) (Granger *et al*, 1993), the Frenchay Activities of Daily Living Index (FAI) (Holbrook and Skillbeck, 1983; Wade *et al*, 1985) and the Berg Balance Scale (Berg) (Berg *et al*, 1989). The FIM measures independence in mobility and personal self-care, and is scored out of 126. The FAI examines the level of activity in general household and everyday tasks, and the extent of social activities; it is scored out of 42. The Berg measures 14 aspects of functional balance, including transfer, reach, and turning (maximum score 56). These standardized instruments were used to limit the potential information biases of using unblinded interviewers.

Assessment of quality of life

The Short Form-36 (SF-36) (Ware *et al*, 1993; Kongsakon and Silpakit, 2000) (MOS 36 Thai version) was then self-administered in the standardized manner, with no interpretation of the questions by the interviewer. This instrument measures quality of life in eight health domains: physical function, physical role, bodily pain, general health, vitality, social functioning, emotional role and mental health. A single measure of change in health status over the preceding year is also included. The SF-36 data were analyzed according to the instruction manual. The SF-36 has been studied for both reliability and validity under Thai conditions (Kongsakon and Silpakit, 2000).

All interviews were conducted by the same trained interviewer, using the same format for each subject. The interviewer was not given the fracture status of the subjects to reduce possible bias. The SF-36 was self-administered by the subjects in accordance with the instruction manual. The research physiotherapist then administered the FIM, FAI and the Berg.

Exploratory analyses were performed using comparison between groups (unpaired *t*-tests and Mann-Whitney); a p-value ≤ 0.05 was considered significant. The confidence intervals were set at 95% and a 0.05. χ^2 tests were used for categorical data, and Pearson or Spearman's rank was used to determine the relationship between SF-36 and functional assessment. Data were checked for normality prior to multiple regression analysis.

All tests were performed using the Statistical Analysis System (SAS/STAT, SAS Institute, Cary, NC).

RESULTS

A letter of invitation was sent to 82 subjects who met the inclusion criteria at the time of discharge from hospital. However, due to changed circumstances since discharge, 22 potential subjects no longer met the inclusion criteria as they had moved into residential care, had undergone knee or hip replacement surgery, had cognitive impairment, or were deceased. Sixty subjects were recruited with primary hip fracture, who continued to meet the inclusion criteria at study entry and wished to participate; a recruitment rate of 73.17%. The fracture group consisted of 36 females and 24 males, and the numbers of age- and gender-matched controls were the same.

Demographic data for the two study groups are shown in Table 1. The hip fracture population scored significantly worse than the controls on all levels of functionality. The fracture group had more difficulties with balance, and was generally less active than the non-fracture group.

There were no significant differences between the genders on any of the functional measures including FIM, FAI and the Berg, within either the fracture group or the control group. The female fracture group, however, scored significantly less than

the female controls on all functional measures, as did the male fracture group when compared to the male control group (Table 1).

The results for the eight domains of the SF-36 are shown in Fig 1. For all eight measures, the fracture subjects were significantly worse off than the control (Mann-Whitney test, $p<0.05$). The fracture group was more likely to report that their health was worse than the previous year (χ^2 = $p<0.001$), which would have been prior to their hip-fracture. The female hip-fracture population

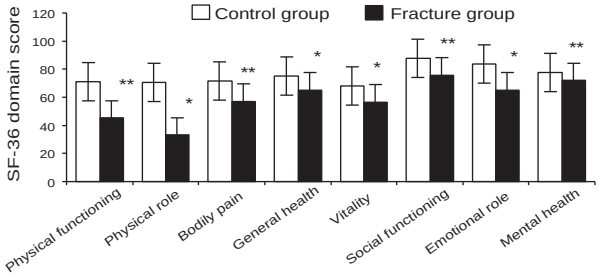

Fig 1–Comparison of quality of life for the fracture and control group. *p<0.001, **p<0.05.

Table 1
Demographic and functional status of the two groups by gender.

	Control group		Hip-fracture group			
	Gender	Mean ± SD	Gender	Mean ± SD	95% CI	p-value
Age	All (n=60)	75.73 ± 9.03	All (n=60)	75.88 ± 9.12	-2.29-2.79	0.96
(years)	M (n=24)	73.47 ± 9.49	M (n=24)	73.86 ± 10.13	-4.52-5.29	0.95
	F (n=36)	76.94 ± 6.19	F (n=36)	76.96 ± 8.43	-3.06-3.1	0.95
FIM	All (n=60)	103.50 ± 0.17	All (n=60)	95.44 ± 5.33	1.76-4.05	0.03[a]
(range 1-126)	M (n=24)	103.47 ± 0.59	M (n=24)	94.46 ± 6.39	1.17-5.71	0.01[a]
	F (n=36)	102.56 ± 1.92	F (n=36)	95.80 ± 4.72	1.31-3.92	0.04[a]
FAI	All (n=60)	30.97 ± 5.96	All (n=60)	23.68 ± 7.76	5.06-9.09	0.04[a]
(range 0-60)	M (n=24)	27.97 ± 6.67	M (n=24)	22.84 ± 11.3	0.48-9.77	0.05[a]
	F (n=36)	32.25 ± 4.99	F (n=36)	24.08 ± 6.91	5.27-9.63	0.04[a]
BBS	All (n=55)	54.05 ± 3.76	All (n=55)	46.21 ± 9.87	5.69-10.0	0.04[a]
(range 1-56)	M (n=22)	54.03 ± 3.91	M (n=22)	47.28 ± 12.07	2.27-11.23	0.05[a]
	F (n=36)	54.07 ± 3.71	F (n=36)	45.63 ± 8.37	6.09-10.78	0.01[a]

FIM: Functional Independence Measure, FAI: Frenchay Activity of Daily Living Index, BBS: Berg Balance Scale, CI; confidence intervals, [a]Statistically significant difference ($p<0.05$) *versus* the control group.

Table 2
Correlation coefficients between the functional measure and the SF-36 domain.

SF-36 domain	Berg	FAI	FIM	Bodily pain	Physical role	Physical function
-Physical function	**0.57**[a]	**-0.69**[a]	**0.53**[a]	**0.26**[a]	**0.47**[a]	
-Physical role	**0.36**[a]	**-0.37**[a]	**-0.32**[a]	**0.34**[a]		0.61[a]
-Bodily pain	**0.27**[b]	**-0.27**[b]	**0.30**[b]		0.64[a]	0.63[a]
FIM	**0.67**[a]	**0.59**[a]	0.26	0.24[b]	0.26[b]	0.37[a]
FAI	**0.75**[a]	-0.39[a]	0.27	0.21[a]	0.21[a]	0.44[a]
Berg		0.37[a]	0.35	0.37[a]	0.41[a]	0.57[a]

Fracture group in bold and control group; Pearson or Spearman rank [a]$p<0.001$; [b]$p<0.05$, FIM = Functional Independence Measure, FAI = Frenchay Activities of Daily Living Index, Berg = Berg Balance Scale.

reported significantly more pain (Mann-Whitney test, p=0.008) and less vitality (Mann-Whitney test, p=0.05) than their male counterparts. Within the control group there were no differences between the genders.

Within-group correlation analysis of both the hip-fracture and control groups showed that the reduction in SF-36 physical component summary index was related to the three functional measures (FIM, FAI and the Berg). The relation between functional assessment and SF-36 scores is shown in Table 2. The Berg, FAI and FIM all exhibited significant Pearson correlation ranges (r = 0.46 to 0.67, p<0.001), indicating a significant correlation between these functional assessments in the hip fracture group. This relationship in the control population was similar, though less pronounced, with Pearson correlations ranging between 0.21 and 0.48 (p<0.05). The SF-36 physical measures, comprising physical function, physical role, and bodily pain, each had stronger associations for the control group (r=0.45-0.54, p<0.001) than for the fracture group (r=0.24-0.40, p<0.001). The respective Spearman's correlation coefficients were 0.48-0.88 for both groups.

DISCUSSION

The expected rise in the number of people aged over 65 in the Thai population will be from 2.2 million in 1998 to 3.5 million by 2016. Not only are more people living longer, but the number living to over 80 years is increasing. As age rises, so do the number of falls and the consequences of those falls, including hip fracture.

Several studies have assessed the effect of hip fracture on functional status, (Wolinsky *et al*, 1997) but most focus on identifying predictors of functional recovery after hip fracture (Magaziner *et al*, 1990; Koval *et al*, 1996). None of these studies employed comphehensive generic SF-36 to assess functional recovery, and few used control groups. These studies reported significant decreases in physical function and social function after hip fracture, supporting the findings of the present study.

The present study has two limitations, that could limit the conclusion of the results, *ie* selection bias and study design. There were two potential sources of selection bias: overly-healthy controls and a poor recruitment rate. As the controls were recruited through the media and various community groups, there was a chance of overly-healthy controls. The decline in level of function after a hip fracture is well documented and may be a reflection of a poorer functional status pre-fracture (Chrischilles *et al*, 1991). If this is true, it may account for some of the differences in functional status found between the groups. While a prospective cohort study could evaluate this aspect, it was not feasible with this study, as any attempt to estimate pre-fracture functional status retrospectively, with an elderly population, would be open to bias due to memory deterioration.

In this study, it have been demonstrated that the fracture subjects were worse off physically and also from the perspective of wellbeing, than their peer group. Hip-fracture subjects require more help with everyday tasks, socialize less, and walk more slowly with diminished balance and confidence, when compared with their non-fracture peer group. There was little difference in the levels of recovery between males and females. The effects of impaired balance and mobility, along with reduced functional and social independence, are reflected in the diminished QOL perceived by the fracture group.

The use of the SF-36 and other health-related QOL instruments in the older population has been debated over recent years (Hayes *et al*, 1995; McHorney, 1996). Kongsakon and Silpakit (2000) reported that, despite problems with consistency and completion rate, the SF-36 was more sensitive than other comparable instruments. Despite the trend in measuring QOL as a health outcome, few have reported these measures in the long-term hip fracture population. This study provides a unique insight into these QOL measures and their relationship with function. Three of the SF-36 domains, physical functioning, bodily pain and physical role illustrate the magnitude of the reduction in the physical measures between the hip-fracture and control groups in this study.

This study has certain strengths. The age- and gender-matched control population was not derived from hospital clinic sources, but came from the same community-based population as

the fracture subjects.

Finally, the study design was such that the evaluations were carried out in our institution by one interviewer who was unaware of the fracture status of the subject, to ensure comparability of the test situation. Clearly, however, it remains possible that this study could have missed significant unmeasured factors accounting for the group differences observed, as is possible in all case-control studies. The applicability of these study results to other populations needs careful consideration. It must be recognized that the fracture subjects presented with clinically apparent hip pain.

In summary, this study demonstrated the detrimental impact of hip fracture on both quality of life and functionality in a group with clinical symtoms. The reduction in functional independence in the fracture group resulted in a reduction of quality of life. Hip fracture patients frequently did not return to their pre-fracture lifestyle. The adverse impact of hip fracture on quality of life and functionality needs to be recognized by medical practitioners, and health personnel in the community so that adequate health resources can be devoted to the prevention and treatment of this debilitating condition.

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