Use of hip protector in elderly Chinese women: a one-year observational study

ORIGINAL ARTICLE

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ABSTRACT

Purpose. This one-year observational study assessed the compliance with hip protector use in elderly Chinese women with hip injury and possible factors that influence compliance.

Methods. Demographics, socioeconomic information and compliance at 1, 3, 6 and 12 months after discharge in 33 compliant and 32 non-compliant patients were compared.

Results. The compliance rate of hip protector use was maintained to above 60% up to the 6-month follow-up but dropped to 50.8% after 1 year. Patients who were aware of the importance of wearing hip protectors were significantly more compliant (p=0.001). Education programmes and close monitoring by clinical staff during hospital stay and after discharge increased patient awareness. Besides, adaptation of hip protectors for individual needs reduced discomfort and poor fits. Most non-compliance factors were related to wound pain and skin allergy (p=0.02), rather than the device design and difficulties in daily functioning. The relative risk of recurrent falls was 1.34, and none of the fallers reported hip fracture.

Conclusion. The compliance rate of hip protector use in elderly Chinese women was moderate. The effectiveness of hip protectors as a means of reducing hip fracture could not be justified, as the risk of falls or hip fractures was not higher in non-compliant patients.

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INTRODUCTION

The number of hip fractures worldwide is estimated to increase from 1.66 million in 1990 to 6.26 million in 2050.[1] In 2050, most hip fractures will occur in Asian populations. A higher incidence of such fractures can be expected if preventive measures (e.g. hip protectors) are not improved or undertaken.

Hip protectors have been effective in reducing hip fracture as a result of falls.[2,3] However, patient non-compliance is common, owing to intrinsic factors (e.g. discomfort, being unaccustomed to their use, or not fashionable) and extrinsic factors (environment being too hot and/or too humid, lack of assistance from caregiver).[4-9] Furthermore, hip protectors were originally designed for Caucasians and may not be suitable for Asians in a subtropical climate.

This study assessed the compliance with hip protector use in elderly Chinese women with hip injury and possible factors that influence compliance.

MATERIALS AND METHODS

Patients

The study was performed at 2 hospitals between February 2006 and July 2008. Patients were recruited from orthopedic wards of an acute hospital (Prince of Wales Hospital) and a rehabilitation hospital (Tai Po Hospital). Elderly Chinese women who presented to hospital with a hip or pubic fracture as a result of fall were included. Those without caregiver assistance in

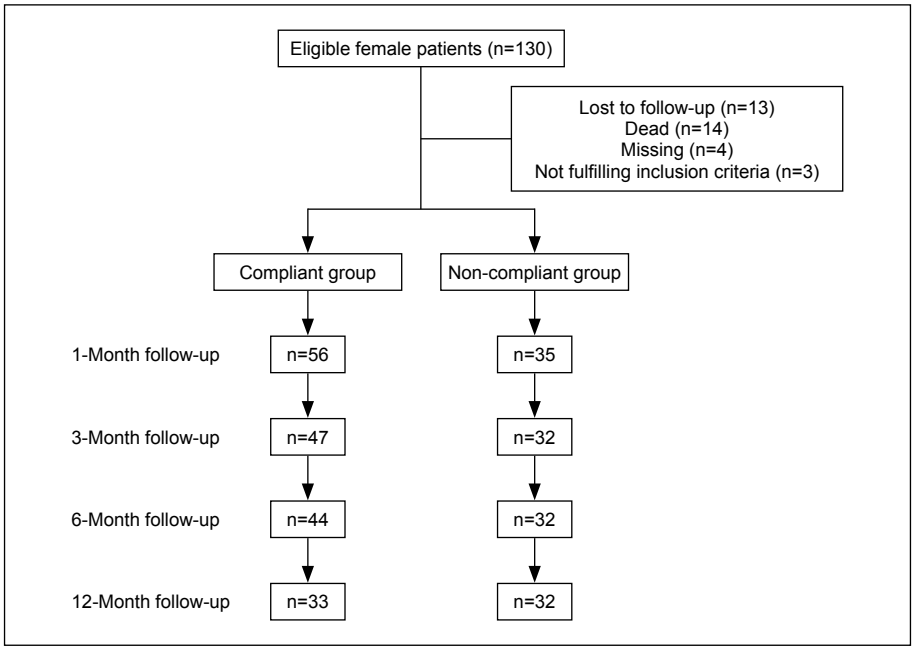

Figure. Flowchart of subjects

washing and dressing hip protectors were excluded. Of 130 women, 34 were lost to follow-up, dead, missing or did not fulfil criteria during follow-up (**Figure**). At the 12-month follow-up, only 65 women remained and were included for analysis. This study was approved by the ethics committees of the Chinese University of Hong Kong and the New Territories East Cluster.

Hip protector

The hip protector consisted of an elastic short pant and 2 hip pads covering the trochanter region. It was specially designed with anthropometric data of older Chinese women with reference to biomechanical and force attenuation properties of the device.[10] The elastic short pants were made with stretchable cotton and soft lycra, which provided good dimensional stability, air permeability, moisture absorbency, and comfort as well as resistance to shrinkage. The hip pad was a shell-shaped, silicone, thermal plastic, protective shield that provided cushioning and force attenuation. Each subject was given 3 sets of hip protectors to wear for 24 hours a day. The device was adapted by occupational therapists to fit individual body sizes and it can be worn over the diapers.

Procedure

During the hospital phase, an orthopaedic surgeon introduced the hip protector and educated the patients about its importance in preventing hip fracture. When a patient's condition became stable, an occupational therapist provided tailor-made hip protectors. At 1, 3, 6, and 12 months after discharge from hospital, the patient demographics, the compliance rate and the reasons for non-compliance were recorded. Awareness about the importance of wearing hip protectors was assessed by asking the question "What is the use of the hip protector?" Those who could correctly answer the question were considered aware of its importance. Furthermore, orthopaedic nurses conducted monthly follow-ups by phone to record falls and injuries during the study period.

Outcomes measures

Based on monthly self-reporting and regular follow-up calls, compliance was measured in terms of the number of hours the subject wore the hip protector. Those who wore it ≥70% of waking hours were considered compliant. Recurrent falls and the occurrence of hip fractures were also recorded. Hospital records were used as a secondary check.

Statistics

The associations between compliance, demographics, health-related variables, and awareness about

Table 1
Baseline characteristics of subjects

Characteristic	No. (%) of subjects	
	Compliant at 12 months (n=33)	Non-compliant at 12 months (n=32)
Age		
Young old (65-74 years)	1 (2.7)	6 (18.8)
Mid old (75-84 years)	21 (63.6)	13 (40.6)
Old old (≥85 years)	11 (33.3)	13 (40.6)
Schooling		
Illiterate	16 (48.5)	15 (46.9)
Educated	12 (36.4)	9 (28.1)
Fracture site		
Neck of femur	21 (63.6)	19 (59.4)
Trochanter of femur	10 (30.3)	12 (37.5)
Pubic rami	2 (6.1)	1 (3.1)
Fracture side		
Right	12 (36.4)	22 (68.8)
Left	20 (60.6)	10 (31.3)
Both	1 (3.0)	0 (0)
Operation		
Hip screw	7 (21.2)	8 (25.0)
Dynamic hip screw	4 (12.1)	3 (9.4)
Gamma nail	4 (12.1)	9 (28.1)
AMA	16 (48.5)	11 (34.4)
Conservative treatment	2 (6.1)	1 (3.1)
No. of pre-morbid diseases		
1-3	25 (75.8)	24 (75.0)
≥4	8 (24.2)	8 (25.0)
Level of care		
Alone	7 (21.2)	5 (15.6)
Need support	26 (78.8)	27 (84.4)

the importance of wearing the hip protector were evaluated using the 2 sample T-test and the Mann-Whitney test. Variables pertaining to the 2 groups were compared using Chi squared and Fisher's exact tests.

RESULTS

At the 12-month follow-up, 33 women were deemed compliant and 32 non-compliant (**Table 1**). The mean patient age in these 2 groups was similar (82.2 vs. 82.4 years), as were the number of pre-morbid diseases, fracture site, type of operation, education level, and social support, except for the fracture side (60.6% on the left in the compliant group vs. 68.8% on the right in the non-compliant group, p=0.008).

The overall compliance rate was 59.6%. More than 20% of the patients wore the hip protector for 16 to 24 hours a day throughout the year (**Table 2**). At the 1-, 3-, and 6-month follow-up, the compliance rates were maintained at above 60% but decreased to 50.8% at the 12-month follow-up (**Table 2**).

30 (90.9%) women in the compliant group and 20 (62.5%) women in the non-compliant group were aware of the importance of wearing hip protectors. They were significantly more compliant with hip protector use (p=0.008).

The reasons for non-compliance are listed in **Table 3**. Most were related to health: skin allergy (37.5%, p=0.008) and wound pain (34.4%, p=0.28).

Table 2
Compliance with wearing hip protectors at different stages of follow-up

Compliance (% of waking hours hip protectors were worn)	Compliance (hours)	Follow-up No. (%) of subjects			
		1-month (n=91)	3-month (n=78)	6-month (n=67)	12-month (n=65)
0	0	22 (24.2)	14 (17.9)	17 (25.4)	21 (32.3)
1-49	1-7	5 (5.5)	9 (11.5)	3 (4.5)	7 (10.8)
50-69	8-10	8 (8.8)	8 (10.3)	3 (4.5)	4 (6.2)
70-99	11-15	32 (35.2)	24 (30.8)	26 (38.8)	19 (29.2)
100	16-24	24 (26.4)	23 (29.5)	18 (26.9)	14 (21.5)

Table 3
The reasons for non-compliance with wearing hip protectors

Reasons	No. (%) of subjects (n=32)	Chi-square/ Fisher exact	Sig (2-tailed)
Hip protector			
Too tight	0	0.99	1.00
Discomfort of the hip pad	4 (12.5)	2.05	0.20
Health			
Too hot	6 (18.8)	0.55	0.51
Skin allergy	12 (37.5)	7.39	0.008
Wound pain	11 (34.4)	1.41	0.28
Functional			
Difficult to go toileting	1 (3.1)	1.13	0.36
Difficult to sleep	3 (9.4)	0.32	1.00
On diaper	2 (6.3)	2.13	0.24
Non-medical			
Not willing to wear	1 (3.1)	1.05	0.49

Other reasons included discomfort of the hip pad (p=0.20), being too hot (p=0.51), difficulty sleeping (p=1.00), and wearing diapers (p=0.24).

During the 29-month study period, 16 women reported one fall and one reported 2 falls. The percentages having recurrent falls were 27.3% in the compliant group and 21.9% in the non-compliant group; the relative risk of falls was 1.34 (95% confidence interval, 0.43-4.17). Most fall injuries consisted of contusions and soft-tissue injury; no hip fracture was encountered (**Table 4**). The readmission rates to hospital in the compliant and non-compliant groups were 15.2% and 12.5%, respectively.

DISCUSSION

The compliance rate of our patients was maintained at above 60% up to the 6-month follow-up but dropped to 50.8% after 1 year. This corresponded roughly to findings of a study reported in 2003,[11] in which the compliance rate dropped from 65% to 45% over a one-year follow-up. The compliance rates in our patients were within the 55 to 70% range of a local study.[12]

Compliance with hip protector use can be enhanced by educational programmes.[4] In our study, the importance of wearing the hip protector for preventing hip fracture was reinforced by an orthopaedic surgeon. Misconceptions about hip fractures and operations were discussed. Compliance was higher when awareness of its importance increased. Having a contact person to follow up is important for continued use of hip protectors by patients.[13] In our study, to facilitate better compliance, the occupational therapist followed up the patients at month 1, 3, 6 and 12. To reinforce compliance, the

Table 4
Recurrent falls and injured sites

Fall and injured site	Compliant at 12 months (n=33)	Non-compliant at 12 months (n=32)
No. of recurrent fall	10	7
Injury		
Head and face	1	1
Upper limb	1	2
Lower limb	1	0
Back	0	1
Hip fracture	0	0
Nil	6	3
Readmission to hospital	5	4

hip protectors were adapted to fit the smaller body builds of elderly Chinese women.[12,14]

Most non-compliance factors were health related (wound pain and skin allergy), rather than the device design and difficulty in daily functioning. As almost all our patients underwent hip surgery, surgical wound pain may have persisted in the initial phase. After removing the hip pad on the surgery side, wound pain tended to resolve. Skin allergy was related to the subtropical climate of Hong Kong. Provision of an extra set of hip pants and frequent changes appear advisable.

In the compliant versus non-compliant groups, the relative risk of recurrent falls was 1.34 (95% CI, 0.43-4.17), which was very similar to that in another study (relative risk, 1.23; 95% CI, 0.89-1.57).[11] The risk of falls or hip fractures was not higher in the non-compliant group, suggesting that the efficacy of hip protectors could not be justified or that the sample size was too small. It is recommended that in future studies the sample size should be larger, and applicability to male subjects should be addressed.

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