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Recovery of Walking Ability and Return to Community Living within 60 Days of Hip Fracture Does Not Differ Between Male and Female Survivors

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Abstract

Objectives—To compare risk-adjusted differences between men and women 30 and 60 days after hip fracture surgery in not walking, ability to return home in a community-dwelling subset, not walking in a nursing home resident subset, and mortality within 60 days.

Design—Cohort study.

Setting—Data were from a randomized clinical trial that compared two blood transfusion protocols after hip fracture.

Participants—Individuals with hip fracture (N = 2,016; 489 (24%) male).

Measurements—Walking, dwelling, and mortality were determined in telephone follow-up 30 and 60 days after randomization, which occurred within 3 days of surgery. Sex differences for each outcome were compared using univariate and multivariate regression adjusting for potential confounders.

Results—Men were younger ($P < .001$) and more likely to have comorbidity ($P = .003$) than women at the time of hip fracture and to die within 60 days, even after risk adjustment (odds ratio (OR) = 1.76, 95% confidence interval (CI) = 1.15–2.69). After risk adjustment, male survivors were as likely as female survivors not to walk (OR = 1.03, 95% CI = 0.78–1.34) and no less likely to return home (OR = 0.90, 95% CI = 0.69–1.17) 60 days after hip fracture. No differences were

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noted between male and female nursing home residents in not walking within 60 days (OR = 0.95, 95% CI = 0.32–2.86).

Conclusion—Although men experience higher mortality, male survivors can expect recovery of walking ability similar to that of female survivors and are as likely to return to community living.

Keywords

hip fracture; functional recovery; sex differences

Hip fracture in common in older people, and 70% of hip fractures occur in women.[1] Although mortality is reported to be higher in men than women,[2] less is known about whether functional recovery differs between men and women who survive hip fracture. Studies comparing functional recovery of men and women with at least 3 to 6 months of follow-up report that men and women appear to recover to similar levels within 6 months of hip fracture.[3–7]

In contrast, studies that have compared functional recovery of men and women within 30 to 60 days of hip fracture have reported heterogeneous findings. Two studies reported that women had better recovery,[8,9] another reported that men had better recovery,[10] and another reported no difference in recovery.[11] More investigation is needed to determine whether early recovery is different between the sexes for those who survive their hip fracture to assist in setting realistic expectations of the trajectory of recovery for individuals and their families. It will also inform healthcare providers' decisions about postfracture care needs, including rehabilitation trajectory.

Evidence is also sparse for recovery after hip fracture for those who live in nursing homes and those who have cognitive impairment at the time of hip fracture.[12–14] To the knowledge of the authors of the current study, no previous study has compared functional recovery within 60 days after hip fracture of men and women who were living in a nursing home at the time of their hip fracture.

The primary purpose of this analysis of data from the Trigger Trial for Functional Outcomes in Cardiovascular Patients Undergoing Surgical Hip Fracture Repair (FOCUS)[15] was to compare risk-adjusted differences in walking ability 30 and 60 days after randomization, which occurred within 3 days of hip fracture surgery, of men and women. Differences between men and women at these same intervals in ability to return home for those who were residing in the community at the time of hip fracture and to recover the ability to walk for those who were nursing homes residents at the time of hip fracture were also contrasted. Finally, risk-adjusted 60-day mortality was compared.

Methods

Current Study Design

This was a secondary analysis using subjects (N = 2,016) who were randomly allocated in the FOCUS trial. The main results of this randomized clinical trial (RCT) have been

reported previously.[15] Because the main FOCUS results were negative, study groups were combined for this analysis.

FOCUS Trial Overview

The trial was performed at 47 centers in North America. Individuals aged 50 and older undergoing surgical repair of hip fracture with clinical evidence of cardiovascular disease or cardiovascular disease risk factors were eligible. People were excluded if they were unable to walk without human assistance before hip fracture, declined blood transfusions, had multiple traumas, had pathological fracture of the hip due to malignancy, had clinically recognized acute myocardial infarction within 30 days before randomization, had symptoms associated with anemia (e.g., ischemic chest pain), or were actively bleeding at the time of potential randomization. Subjects were randomized to receive restrictive or liberal blood transfusion after hip fracture if they had a hemoglobin concentration less than 10 g/dL within 3 days after surgery. Subjects in the restrictive transfusion group received blood transfusion when hemoglobin dropped below 8 g/dL or they became symptomatic. Subjects in the liberal transfusion group received transfusion when hemoglobin was less than 10 g/dL and enough transfusion to maintain the hemoglobin above 10 g/dL throughout their hospital stay.

All outcomes were ascertained through telephone follow-up 30 and 60 days after randomization. The primary outcome of the FOCUS trial was death or inability to walk 10 feet (or across a room) without human assistance up to 60 days after randomization. Secondary outcomes included inability to walk 10 feet at 30 days, residence 30 and 60 days after hospitalization, and death for any reason within 60 days. No differences were observed between treatment groups.[15] Walking 10 feet or across a room was selected as the primary outcome in the FOCUS trial because of the predictive validity of the 60-day measure of ambulation with regard to 6-, 12-, and 24-month mortality; nursing home residence; and function as evaluated in a Baltimore Hip Studies cohort of 674 individuals with hip fracture.[16] It also is objective and easy to measure in a large study relying on telephone interviews.

Study Population and Current Outcomes

Risk-adjusted differences between men and women who were alive at the respective time point in inability to walk 10 feet without human assistance 30 and 60 days after randomization, return home 30 and 60 days after randomization in a subset of individuals who resided in the community at the time of hip fracture, and inability to walk 10 feet without human assistance 30 and 60 days after randomization in a subset of individuals who resided in a nursing home at the time of hip fracture were compared. Unadjusted mortality (in-hospital, 30 and 60 days after randomization) and risk-adjusted mortality at 60 days in men and women were also compared.

Covariates

Information was collected on several baseline characteristics with the potential to differ between men and women and to affect outcomes.[15] Baseline cardiovascular disease (coronary artery disease, congestive heart failure, stroke or transient ischemic attack, and

peripheral vascular disease) and risk factors (hypercholesterolemia, diabetes mellitus, smoking, hypertension, creatinine >2.0 mg/dL) were ascertained upon study entry, as were preexisting dementia, lung disease, and American Society of Anesthesiologists (ASA) physical status classification. Information was also collected on residence at time of hip fracture.

Analysis

Descriptive analyses were completed to compare baseline status of men and women for the selected covariates used in the multivariate analyses: cardiovascular disease (collapsed into a single category), cardiovascular risk factors (diabetes mellitus, smoking and creatinine >2.0 mg/dL), age, lung disease, dementia, and ASA rating.

Unadjusted comparisons were made of the outcomes using the Fisher exact test for categorical variables and *t*-tests for age. Logistic regression was used to adjust for potential confounding of the above-listed covariates for each outcome of interest. Group allocation from the original RCT was also entered into all models as a control variable. All analyses were performed using SAS version 9.2 (SAS Institute, Inc., Cary, NC).

Results

Demographic Characteristics

Of 2,016 subjects, 489 (24%) were male, and 1,903 (94%) were aged 65 and older. Men were slightly younger than women at time of hip fracture and had more comorbidities and a significantly higher ASA rating (Table 1). Similar proportions of men and women were admitted with preexisting dementia (31%) and from nursing home settings (10.5%) (Table 1).

Walking Ability 30 and 60 Days After Randomization

Similar proportions of men and women who survived their hip fracture were unable to walk 30 or 60 days after randomization; approximately 30% of the previously ambulatory cohort were not ambulating 10 feet without human assistance 60 days after randomization (Table 2). After adjusting for potential confounders, walking ability remained similar between male and female survivors at 30 and 60 days (Table 3). Older age, preexisting dementia, admission from a nursing home, cardiovascular disease, and higher ASA risk score were associated with significantly greater odds of not ambulating 30 or 60 days after randomization (Table 3).

Home Residence 30 and 60 Days After Randomization in the Community-Dwelling Subset

Of surviving community-dwelling subjects, 848 (50%) had not returned home 30 days after fracture and 492 (30%) had not returned home 60 days after fracture, with no difference noted between men and women (Table 2). After risk adjustment, no differences were noted between men and women in ability to return to home (Table 3). Older age, dementia and higher ASA rating were associated with not being at home 30 or 60 days after hip fracture (Table 3).

Walking Ability 30 and 60 Days After Randomization in the Nursing Home Subset

For the 214 subjects residing in a nursing home at the time of hip fracture, 183 (86%) were alive 30 days after randomization, and 166 (78%) were alive 60 days after randomization. Male nursing home residents who survived their hip fracture were as likely as female survivors not to be walking 30 and 60 days postoperatively (Table 2). Only 39 (22%) were walking 10 feet without human assistance at 30 days, increasing to 53 (32%) 60 days after randomization.

Male and female nursing home survivors remained similar in their walking ability 30 and 60 days after randomization after risk adjustment. Only a history of dementia was significantly associated with not walking 10 feet without human assistance 30 days after hip fracture (Table 3). None of the selected covariates distinguished walkers from nonwalkers 60 days after a hip fracture in this subset of subjects (Table 3).

Mortality Within 60 Days of Hip Fracture

Significantly more men had died at all three time periods (in hospital, 30 and 60 days after randomization) (Table 2). Even after risk adjustment, men were more likely than women to die within 60 days after hip fracture (odds ratio = 1.76; 95% confidence interval = 1.15–2.69).

Discussion

This secondary analysis of 2,016 patients with hip fracture found that men who survive hip fracture have recovery of independent walking ability within the first 60 days after hip fracture similar to that of women, regardless of prefracture residence. Community-dwelling male survivors also returned home within 60 days of hip fracture in similar proportions as women. Similar to other studies,[2,17–19] the current study found that men were slightly younger and had more comorbidities than women at time of hip fracture and were significantly more likely to die within 60 days after hip fracture, even after risk adjustment.

Previous studies comparing recovery of men and women have reported heterogeneous outcomes within the first 60 days after hip fracture.[8–11] Some of the reported heterogeneity may be due to the selected measure of function, characteristics of study populations, or timing of functional assessments. Most previous studies used composite measures of function such as the Functional Independence Measure or Barthel Index, and most have required subjects to be eligible for admission to a rehabilitation setting;[8–11] thus, only subjects with normal cognition or very mild cognitive impairment were included in these studies. Reported follow-up periods also varied widely between studies, from 2 weeks to more than 3 months after fracture, making study comparisons difficult.[8–11]

Unlike other studies, the current study examined a single, easily understood, important outcome of hip fracture (ability to ambulate without human assistance) and included two subgroups of individuals who are frequently excluded from research studies—nursing home residents and those with preexisting dementia. The inclusion of these subgroups greatly increases the generalizability of the findings to the overall hip fracture population, in which

dementia is highly prevalent[20] and up to 25% of individuals with hip fracture may be admitted from a nursing home.[12,14]

The likelihood of return to home after hip fracture of community-dwelling men and women was also compared. A significant proportion of subjects were still in transitional care (rehabilitation or other care settings) 60 days after hip fracture, so it was not possible to assess rates of new institutional residence. Others have reported mixed results, with some studies reporting greater likelihood of institutionalization in men than women and others finding no differences.[17,21] The results of the current study suggest that, at 60 days, men are as likely as women to return home. Underlying dementia, greater comorbid disease load, and age appeared to predispose people to requiring longer-term postoperative care, similar to findings reported previously.[13,22]

In nursing home cohort subanalyses, no difference was found in functional recovery between men and women who survive 30 or 60 days after fracture. Mortality was high (22% within 60 days of hip fracture), and only 32% of the nursing home residents had regained their ambulatory capacity within 60 days of hip fracture. None of the selected covariates, including preexisting dementia, distinguished those who ambulated at 60 days from those who did not. It is possible that environmental factors such as staff resources and capacity to provide rehabilitation in nursing home settings affects functional recovery in this oldest cohort; it also is possible that individuals nursing home residents who fracture their hip have such a low level of physical and cognitive reserve that the covariates measured had limited effect.

As expected, mortality, even after risk adjustment, was higher in men than women at all evaluation periods.

The large RCT used predefined covariates and outcome measures and had excellent ascertainment of outcomes, allowing for the in-depth secondary analyses of data to determine factors associated with early recovery of ambulation after a hip fractures. Although telephone follow-up was used, it was used for all respondents, which should prevent differential bias between reported outcomes in men and women. Despite examining walking ability only up to 60 days after hip fracture, the inclusion of nursing home residents and those with preexisting dementia add to the current body of evidence regarding factors associated with early recovery of walking ability in the overall hip fracture population. Further work is required to follow the full trajectory of recovery in walking and other areas of function and postfracture residence. Further research is also needed to investigate interventions to increase the likelihood that nursing home residents regain ambulatory ability after hip fracture. Also, future studies should consider environmental, social, and other factors that may affect recovery rather than focusing only on medical and functional characteristics.

In summary, although men appear to be more likely to die within 60 days after hip fracture than women, for those who survive, recovery of ambulation and return to community living appears to be similar for men and women 60 days after a hip fracture.

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Table 1
Baseline Characteristics of Study Participants

Characteristic	Men, n = 489 (24)[b]	Women, n = 1,527 (76)[b]	*P*-Value
Age, mean ± standard deviation	79.9 ± 10.1	82.2 ± 8.5	<.001
Liberal transfusion treatment group, n (%)	250 (51)	757 (50)	.57
Comorbidities, n/N (%)			
Cardiovascular disease (any)[a]	358/489 (73)	910/1,537 (60)	<.001
Coronary artery disease	257/489 (53)	548/1,527 (36)	<.001
Congestive heart failure	95/489 (19)	256/1,527 (17)	.19
Cerebrovascular disease	130/489 (27)	343/1,527 (22)	.07
Peripheral vascular disease	84/489 (17)	135/1,527 (9)	<.001
Dementia	140/488 (29)	494/1,524 (32)	.13
Diabetes mellitus	145/485 (30)	363/1,523 (24)	.008
Lung disease	111/487 (23)	266/1,523 (17)	.01
Smoker	89/485 (18)	140/1,522 (9)	<.001
Creatinine >2.0 g/dL	83/484 (17)	86/1,520 (6)	<.001
American Society of Anesthesiologists score, n/N (%)			
1 or 2	63/467 (13)	299/1,472 (20)	.002
3	332/467 (71)	986/1,472 (67)	
4	72/467 (15)	187/1,472 (13)	
Admission from nursing home, n/N (%)	42/488 (9)	172/1,525 (11)	.11

[a] The category of cardiovascular disease (any) was used in all multivariate analyses along with all other covariates specified in Table 1.

[b] Percent.

Table 2
Unadjusted Association Between Baseline Characteristics and Study Outcomes

Outcome	Men	Women	*P*-Value
	n/N (%)		
Overall cohort, not walking[a]			
30 days	196/449 (44)	649/1,451 (45)	.70
60 days	125/434 (29)	431/1,423 (30)	.59
Community dwelling cohort, not at home[a,b]			
30 days	203/414 (49)	645/1,283 (50)	.69
60 days	122/405 (30)	370/1,264 (29)	.75
Nursing home cohort, not walking (%)[a,c]			
30 days	21/28 (75)	121/153 (67)	.62
60 days	14/22 (63)	99/144 (69)	.63
Overall cohort, died			
In-hospital	14/488 (3)	20/1,524 (1)	.03
30 days[d]	36/485 (7)	59/1,510 (4)	.003
60 days[d]	51/485 (11)	91/1,514 (6)	.002

[a] Includes only those alive at that interval.

[b] Includes only those who were living at home or in retirement homes at time of hip fracture (excludes subjects who were in nursing homes or came from other care settings, e.g. rehabilitation or other hospital settings; n = 235) and who were alive at that interval.

[c] Includes only those in nursing home setting at time of hip fracture.

[d] Includes those who died in previous interval.

Table 3

Association Between Baseline Characteristics and Study Outcomes for All Survivors and for Those Survivors Admitted from Community and Nursing Homes (Adjusted Analyses)

	Not Walking After Hip Fracture: Overall Cohort		Home After Hip Fracture: Community Resident Subgroup[a]		Not Walking After Hip Fracture: Nursing Home Subgroup[b]	
	30 days	60 days	30 days	60 days	30 days	60 days
Characteristic	Odds Ratio (95% Confidence Interval)					
Male	1.00 (0.79–1.28)	1.02 (0.78–1.34)	1.01 (0.79–1.30)	0.90 (0.69–1.17)	0.86 (0.28–2.70)	0.96 (0.32–2.92)
Age[c]	1.02 (1.01–1.03)[d]	1.02 (1.00–1.03)[d]	0.96 (0.95–0.97)[d]	0.98 (0.97–1.00)[d]	0.99 (0.94–1.05)	0.99 (0.94–1.04)
Liberal group	0.88 (0.72–1.08)	1.04 (0.83–1.29)	1.18 (0.96–1.45)	1.17 (0.93–1.46)	1.03 (0.47–2.29)	1.52 (0.71–3.23)
Dementia	2.43 (1.93–3.06)[d]	2.94 (2.30–3.75)[d]	0.43 (0.33–0.55)[d]	0.41 (0.32–0.53)[d]	2.89 (1.13–7.25)[d]	2.05 (0.84–5.00)
Cardiovascular disease (any)	1.29 (1.04–1.60)[d]	1.43 (1.12–1.82)[d]	0.88 (0.71–1.09)	0.78 (0.61–1.00)[d]	1.20 (0.52–2.76)	0.91 (0.41–2.01)
Lung disease	0.86 (0.67–1.16)	1.06 (0.79–1.42)	1.27 (0.96–1.68)	1.10 (0.81–1.49)	1.37 (0.43–4.31)	1.44 (0.51–4.03)
Creatinine >2.0 g/dL	1.52 (1.05–2.19)[d]	0.99 (0.66–1.50)	0.72 (0.49–1.06)	1.09 (0.72–1.64)	0.58 (0.05–6.32)	1.22 (0.11–13.21)
Diabetes mellitus	0.99 (0.78–1.25)	1.02 (0.79–1.32)	0.87 (0.68–1.11)	1.03 (0.79–1.34)	1.09 (0.43–2.77)	0.95 (0.41–2.22)
Smoker	0.89 (0.63–1.25)	1.07 (0.73–1.57)	0.82 (0.58–1.16)	1.03 (0.70–1.52)	0.38 (0.08–1.81)	0.88 (0.18–4.24)
ASA category (reference 1 or 2)						
3	1.41 (1.08–1.85)[d]	1.82 (1.30–2.53)[d]	0.80 (0.61–1.05)	0.72 (0.53–0.99)[d]	1.42 (0.30–6.74)	0.92 (0.20–4.13)
4	2.27 (1.54–3.33)[d]	2.91 (1.88–4.49)[d]	0.56 (0.38–0.84)[d]	0.48 (0.31–0.74)[d]	6.73 (0.98–48.33)	2.95 (0.50–17.61)
Nursing home resident	2.73 (1.83–4.07)[d]	3.17 (2.16–4.67)[d]				

Covariates: age; sex; Transfusion Trigger Trial for Functional Outcomes in Cardiovascular Patients Undergoing Surgical Hip Fracture Repair liberal allocation group; presence of dementia, cardiovascular disease (any), lung diseases, creatinine >2.0 g/dL, or diabetes mellitus; America Society of Anesthesiologists (ASA) category; nursing home residence.

[a] Includes only individuals living at home or in retirement homes at time of hip fracture (excludes subjects who were in nursing homes or came from other care settings, e.g., rehabilitation or other hospital settings; n = 235).

[b] Includes only those in nursing home setting at time of hip fracture.

[c] Per year increase.

[d] $P < .05$.