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Does Venous Thromboembolism Affect Rehabilitation after Hip Fracture Surgery?

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Purpose: Venous thromboembolism (VTE), including deep vein thrombosis and pulmonary embolism, is a serious and life-threatening complication in elderly (older than 65 years) patients undergoing hip fracture surgery (HFS). However, few have reported on the influences of VTE on postoperative rehabilitation in these patients. This study was performed to determine whether VTE affects clinical outcomes in patients who underwent HFS. **Materials and Methods:** We retrospectively evaluated 330 HFSs in 325 consecutive patients, which were performed from January 2009 to June 2010. From chart review, we identified 15 patients with symptomatic VTE. We compared Geriatric depression scale, Modified Barthel index and Berg balance scale scores as well as 10 meter gait speed at discharge and hospital stay between a symptomatic VTE group and a non-VTE group. **Results:** No significant difference in clinical outcomes at discharge between the two groups was found, although hospital stay was longer in patients with symptomatic VTE (p=0.012). **Conclusion:** East Asian patients have a low incidence of symptomatic VTE after HFS, and the clinical outcomes of patients with symptomatic VTE were similar to patients without VTE, although there was a longer rehabilitation period.

Key Words: Venous thromboembolism, rehabilitation, hip fracture, hip fracture surgery

INTRODUCTION

Venous thromboembolism (VTE), including deep vein thrombosis (DVT) and pulmonary embolism (PE), is a potentially life-threatening complication in patients undergoing hip fracture surgery (HFS). Among different case series, the incidence of symptomatic VTE without any thromboprophylaxis following HFS widely ranged from 3% to 50%.[1-6]

Previous studies on VTE have mainly focused on the incidence, risk factors and prophylactic modalities.[1,7-9] VTE following HFS in elderly patients with medical co-morbidities could affect clinical outcomes, ambulatory function and hospital stay after the operation. However, the effect of symptomatic DVT and PE on postoperative rehabilitation in elderly HFS patients is rarely mentioned.[10]

We therefore attempted to discern whether symptomatic VTE affects postoperative rehabilitation in elderly HFS patients.

MATERIALS AND METHODS

From January 2009 to June 2010, 288 patients (293 hips) older than 65 years of age underwent hip surgery due to a femoral neck fracture or an intertrochanteric fracture at our institute. There were 201 women and 87 men with a mean age of 79.6 years (range, 65-96 years) at the time of operation. Their mean body mass index was 21.8 kg/m^2 (range, 13.3-32.0 kg/m^2). Regional anesthesia was used in 270 surgeries and general anesthesia in 23. Hip arthroplasty was performed in 259 hips and internal fixation in 34.

Perioperatively, 8 patients (8 hips) were treated with anticoagulants: 4 patients (4 hips) due to previous history of a thrombo-embolic event, 3 patients (3 hips) due to cardiac disease and 1 patient (1 hips) due to cerebro-vascular disease. In the remaining 280 patients, thigh-length antiembolic stockings were applied and the ankle pump was encouraged without any pharmacological thromboprophylaxis.

On postoperative day 1 to 3, closed suction drainage was removed. On postoperative day 3 to 10, patients were mobilized with protected weight-bearing as tolerated along with use of assistive devices (walker or crutches).

As the patients' walking ability improved, their assistive devices were changed appropriately by a physical therapist. Patients who could not ambulate independently even at 1 week after the operation were transferred to the rehabilitation unit for ambulatory training.

During the hospitalization period, we carefully monitored clinical signs of DVT including pain and tenderness in the calf or thigh, swelling or erythema of the operated limb, and a positive Homans' sign. We suspected DVT or PE in 37 patients who undertook consultation with cardiovascular physicians. A diagnosis of DVT was made using duplex ultrasonography or lower extremity CT angiography. PE was confirmed by a ventilation/perfusion scan or pulmonary CT angiography.

After discharge, patients were routinely followed up at 6 weeks, 3 months and 6 months. Geriatric depression scale, Modified Barthel index, Berg balance scale and 10 meter gait speed were evaluated at 6 weeks follow-up.

The Geriatric depression scale comprises a 30-item easy-to-administer inventory, and is one of the most widely used instruments for screening elderly persons for depression.[6,11,12]

The Modified Barthel index evaluates 10 aspects of daily living, with a maximal value of 100 and a minimal value of 0, in terms of functional status and degree of disability. A score of 100 indicates the absence of disability.[13]

The Berg balance scale evaluates ability of 14 tasks to challenge balance during sitting, standing or stepping. It has a minimum value of 0 and maximum value of 56, and higher values indicate better balance.[14]

We compared VTE patients and non-VTE patients using Fisher's exact test for categorized data and Mann-Whitney U test for continuous data. *p*-values less than 0.05 were considered to be statistically significant.

The design and protocol of this study were reviewed and approved by the institutional review board of our hospital, who waived informed consent (IRB No. B-1006-103-118).

RESULTS

Fifteen patients (5.1%) were diagnosed as having a VTE: 5 patients had symptomatic DVT, 6 had both symptomatic DVT and PE, and 4 had symptomatic PE. Diagnoses were made at 5 to 56 days after the operation (mean, 16.3 days), and these 15 patients were treated with heparin and/or warfarin after the diagnosis (Table 1).

In total, 28 patients who did not undergo the rehabilitative evaluations and 12 patients who could not answer the questions on the Geriatric depression scale were excluded. The remaining 248 patients, 234 non-VTE patients and 14 VTE patients, were included in the comparison.

Baseline characteristics were similar between VTE patients and non-VTE patients (Table 2).

Moreover, there were no significant differences between VTE patients and non-VTE patients in terms of Geriatric depression scale, Modified Barthel index, Berg balance scale and 10 meter gait speed (Table 3).

DISCUSSION

Unlike Western countries who report high incidences of DVT and PE after HFS, symptomatic DVT and PE are uncommon in East Asian patients undergoing HFS. Accordingly, in this study, we attempted to determine whether the occurrence of symptomatic DVT or PE affected rehabilitation after HFS.

In this study, incidence of VTE was 5.1% even without any chemical thromboprophylaxis, which was comparable with that for Western patients after HFS who underwent chemical thromboprophylaxis (Table 4).[15] One explanation for the low incidences of symptomatic VTE in our study might be the low prothrombotic risk factors and the absence of some genetic factors involved in VTE in East Asian patients.[16-21] Old age, female gender, obesity, underlying

Table 1. Patients with Venous Thromboembolism after Hip Fracture Surgery

Patient	Sex/ Age	Diagnosis	Operation time (min)	Interval between fracture and operation (days)	Interval between operation and VTE (days)	VTE	Predisposing factors
Patient 1	F/90	FNF	85	18	28	Ipsilateral DVT*, PE	Delayed operation
Patient 2	F/89	INT	75	5	7	Ipsilateral DVT, PE	None
Patient 3	F/76	INT	65	2	13	PE	None
Patient 4	M/89	INT	85	7	10	Ipsilateral DVT	None
Patient 5	F/84	INT	115	3	15	Bilateral DVT, PE	None
Patient 6	F/90	FNF	90	10	19	PE	Delayed operation
Patient 7	F/80	FNF	150	3	9	Contralateral DVT, PE	None
Patient 8	F/82	INT	125	5	12	Ipsilateral DVT*	None
Patient 9	F/95	INT	100	1	18	Ipsilateral DVT	None
Patient 10	F/69	FNF	90	3	8	Ipsilateral DVT, PE	None
Patient 11	F/69	INT	170	27	15	Ipsilateral DVT*, PE	Delayed operation May-Thurner syndrome
Patient 12	M/82	INT	75	5	5	PE	None
Patient 13	M/90	FNF	64	8	5	PE	None
Patient 14	F/81	INT	102	5	33	Bilateral DVT	None
Patient 15	F/81	INT	65	7	56	Ipsilateral DVT*	May-Thurner syndrome

VTE, venous thromboembolism; FNF, femoral neck fracture; INT, intertrochanteric fracture; DVT, deep vein thrombosis; PE, pulmonary embolism.
*Proximal deep vein thrombosis.

Table 2. Comparisons between Non-VTE Patients and VTE Patients

	Non-VTE	VTE	*p* value
Gender			0.565
Male	84	3	
Female	194	12	
Age (yrs)	79.4±7.4	83.1±7.7	0.062
BMI (kg/m^2)	21.7±3.7	22.4±3.3	0.507
Ambulatory ability before injury	2.5±1.9	2.7±1.8	0.723
Type of hip Fracture			0.427
Femoral neck fracture	131	5	
Intertrochanteric fracture	147	10	
Type of surgery			0.231
Arthroplasty	244	15	
Internal fixation	34	0	
Anesthesia			0.617
Regional (spinal/epidural)	255	15	
General	23	0	
ASA score	2.3±0.6	2.3±0.5	0.942
Operation time (min)	89.6±33.1	97.1±31.4	0.392
Time interval between trauma and surgery (days)	9.5±13.9	7.3±6.8	0.533
Transfer to other rehabilitation institutes			0.551
Yes	70	4	
No	208	11	

VTE, venous thromboembolism; BMI, body mass index; THA, total hip arthroplasty; ASA, American Society of Anesthesiology.

Table 3. Comparisons of Clinical Outcomes at Discharge between Non-VTE Patients and VTE Patients

	Non-VTE	VTE	*p* value
Geriatric depression scale	11.2±7.5	16.0±6.0	0.158
Modified Barthel index	49.4±21.9	52.0±27.8	0.806
Berg balance scale	21.3±12.8	17.0±9.4	0.229
10 meter gait speed	58.2±32.1	53.0±28.6	0.750
Hospital stay	26.3±17.1	37.7±15.4	0.012

VTE, venous thromboembolism.

Table 4. Incidence of Symptomatic VTE after HFS in Previous Studies and the Current Study

	No. of HFS	No. of VTE (%)	No. of DVT (%)	No. of PE (%)
Todd, et al.[2]	261	9 (3)	9 (3)	0
Dhillon, et al.[5]	40	20 (50)*	20 (50)*	NA
Lieberman and Lieberman[15]	644	39 (6.1)	39 (6.1)	NA
Current study	293	15 (5.1)	11 (3.8)	10 (3.4)

VTE, venous thromboembolism; HFS, hip fracture surgery; DVT, deep vein thrombosis; PE, pulmonary embolism; NA, not available.
*Including asymptomatic DVT.

disease, type of anesthesia, and prolonged immobilization in bed are known to be risk factors of VTE according to studies from Western countries.[22-25] In our study, no variables were shown to be risk factors of VTE, and only old age showed marginal significance (p=0.062). These results may be explained by ethnic differences between our patients and Western patients or our patient number of VTE patients might not have been large enough to detect the significance of these factors.

In terms of rehabilitation after HFS, the objective of this study, functional recovery as reflected by ambulatory state, the Modified Barthel index, Berg balance scale and gait speed was not significantly decreased even in cases of symptomatic VTE. However, in this study, hospital stay was prolonged in VTE patients (26.3±17.1 vs. 37.7±15.4, p=0.012). After surgery, delayed mobilization, a well-known risk factor for VTE,[23-26] might be the reason for the pronged hospital stay and increased risk of VTE occurrence in these patients. In addition, titration of oral warfarin might be necessary in patients with symptomatic VTE before discharge.

This study has several limitations as a retrospective review of prospectively collected data. First, rehabilitative evaluations were available only in 248 patients. The outcomes of other unavailable 40 patients could affect our results. Second, the fact that the rehabilitation was not affected by occurrence of VTE could be related to relatively small numbers of patients with inadequate power to detect differences. Third, we did not perform studies to confirm asymptomatic VTE and could not determine the incidence of asymptomatic VTE. It might be argued that VTE patients might have received more intensive rehabilitation than non-VTE patients, which might have affected the results. However, the duration of physical therapy was similar in the two groups.

In conclusion, our study showed that occurrence of symptomatic DVT and PE did not affect rehabilitation after HFS in East Asian patients with a low incidence of symptomatic VTE.

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