Association between preoperative transthoracic echocardiography and clinical outcomes after scheduled hip fracture surgery in geriatric patients

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Background

Hip fracture has become one of main problem in the elderly patients by progress of the aging society. Transthoracic echocardiography (TTE) is still widely performed for purpose of assessing the risk associated cardiovascular disease in individuals who undergo hip fracture surgery while routine echocardiography was not recommended for the preoperative assessment in individuals undergoing noncardiac surgery by recently published international guidelines. Thus, we evaluated the relevance of the variables of TTE and the outcomes in elderly patients with hip fracture.

Material and Methods

We conducted single-center, retrospective medical record review including a total of 356 patients. The study population included patients 65 years of age and older underwent TTE within a month before the scheduled hip fracture surgery for the pre-operative assessment between January 2013 and October 2016. Bilateral hip fracture surgery and re-operation due to complication of the previous hip surgery were excluded. Primary outcome was 30-day mortality after surgery, secondary outcomes were postoperative neurologic and cardiovascular complications. Univariable and multivariable logistic regression were performed to identify whether echocardiographic variables are related to postoperative mortality and complications.

Results

The mean age was 79.7 years (SD=6.7) and 78 (21.9%) were male. Six patients died within 30 days. There was a significant difference in mean age between the survival group and 30-day mortality group(table1). Delirium was the most common postoperative complication (46, 12.9%), and cardiovascular disease was the second most common complication (17, 4.8%). Among TTE variables only LA volume index was found to be associated with postoperative cardiovascular complication in both the univariable and multivariable logistic regression analysis (Table 2).

Conclusions

This study shows that patient’s age was associated postoperative mortality. More careful screening of the elderly patients for pre-operative echocardiography will be necessary.

Variables	Total (N=356)	Survival group (N=350)	Death within 30 day groups (N=6)	p
Age (year)	79.7 ± 6.7	79.6 ± 6.7	87.5 ± 3.3	0.003
Gender				0.616
Male	78 (21.9%)	76 (21.7%)	2 (33.3%)	
Female	278 (78.1%)	274 (78.3%)	4 (66.7%)	
Height (cm)	156.7 ± 7.9	156.8 ± 7.8	152.2 ± 9.2	0.263
Weight (kg)	54.1 ± 9.9	54.1 ± 9.8	52.7 ± 15.5	0.671
BSA (m ²)	1.5 ± 0.2	1.5 ± 0.2	1.4 ± 0.2	0.26
Echo-related factor				
LVEF (%)	62.8 ± 7.6	62.7 ± 7.6	67.3 ± 7.9	0.161
LV Mass	135.0 ± 119.6	135.1 ± 120.3	129.2 ± 21.1	0.779
LVMI (g/m ²)	84.5 ± 23.0	84.5 ± 23.1	81.3 ± 5.0	0.945
LAVI (ml/m ²)	24.1 ± 12.5	24.2 ± 12.6	23.1 ± 9.2	0.953
E (cm/sec)	67.9 ± 18.1	67.9 ± 18.0	69.6 ± 22.8	0.99
A (cm/sec)	92.8 ± 21.3	92.5 ± 21.0	112.4 ± 34.4	0.157
RVP (mmHg)	32.0 ± 7.2	32.0 ± 7.2	33.2 ± 7.6	0.722
E' (cm/sec)	4.8 ± 1.3	4.8 ± 1.3	4.0 ± 1.3	0.141
A' (cm/sec)	8.6 ± 1.9	8.6 ± 1.9	7.8 ± 2.0	0.419
E/E'	15.0 ± 6.7	15.0 ± 6.7	18.5 ± 6.5	0.176
Comorbidity				
Hypertension	224 (62.9%)	221 (63.1%)	3 (50.0%)	0.674
Diabetes mellitus	108 (30.3%)	106 (30.3%)	2 (33.3%)	1
Coronary arterial disease	37 (10.4%)	36 (10.3%)	1 (16.7%)	0.485
Heart failure	22 (6.2%)	20 (5.7%)	2 (33.3%)	0.047
Valvular disease	9 (2.5%)	9 (2.6%)	0 (0.0%)	1
Arrhythmia	20 (5.6%)	19 (5.4%)	1 (16.7%)	0.295
Stroke	65 (18.3%)	63 (18.0%)	2 (33.3%)	0.302
Neurologic disease	83 (23.3%)	81 (23.1%)	2 (33.3%)	0.627
Kidney disease	35 (9.8%)	33 (9.4%)	2 (33.3%)	0.11
Pulmonary disease	57 (16.0%)	56 (16.0%)	1 (16.7%)	1

A, mitral peck velocity of late filling; BSA, body surface area; E, mitral peak velocity of early filling; E', early diastolic mitral annular velocity of the septal mitral annulus; E/E', the ration of mitral peak velocity of early filling(E) to early diastolic mitral annular velocity of the septal mitral annulus(E'); LAVI, left atrial volume index; LVEF, left ventricular ejection fraction; LV Mass, left ventricular mass; LVMI, left ventricular mass index; LV

Table 1. Demographic characteristics, echocardiologic findings and patient's cormobities

	Death within 30 days			Delirium			Cardiovascular complication		
	OR (%)	95% of CI of OR	P	OR (%)	95% of CI of OR	P	Odd ratio	95% of CI of OR	P
Univariable regression analysis									
Transthoracic echocardiographic variables									
LVEF (%)	1.1	0.98-1.25	0.132	0.96	0.91-1.02	0.21	1	0.96-1.04	0.871
LVMI (g/m2)	0.99	0.95-1.04	0.809	1.01	0.99-1.03	0.409	1.01	0.99-1.02	0.455
LAVI (ml/m2)	0.99	0.88-1.06	0.885	1.05	1.02-1.09	0.006	0.99	0.95-1.03	0.764
E (cm/sec)	1.01	0.95-1.05	0.831	1.01	0.98-1.04	0.471	0.99	0.97-1.01	0.575
A (cm/sec)	1.03	1-1.06	0.044	0.99	0.96-1.02	0.493	1	0.98-1.01	0.874
RVP mmHg)	1.02	0.88-1.12	0.748	1	0.92-1.07	0.995	1	0.95-1.05	0.85
E' (cm/sec)	0.52	0.2-1.13	0.131	1.15	0.64-1.65	0.511	0.04	NA-10236423.95	0.99
E/E'	1.04	0.94-1.11	0.258	0.97	0.87-1.05	0.585	0.99	0.94-1.04	0.748
Age	1.21	1.06-0.4	0.007	1.01	0.97-1.06	0.572	1.06	0.99-1.44	0.122
Multivariable regression analysis									
Age	1.19	1.03-1.36	0.016	-	-	-	-	-	-
LAVI (ml/m2)	-	-	-	-	-	-	1.21	1.03-1.42	0.02

E', early diastolic mitral annular velocity of the septal mitral annulus; E/E', the ration of mitral peak velocity of early filling(E) to early diastolic mitral annular velocity of the septal mitral annulus(E'); LAVI, left atrial volume index; LVEF, left ventricular ejection fraction; LV Mass, left ventricular mass; LVMI, left ventricular mass index

Table 2. Results of the univariable and multivariable regression analysis of between the transthoracic echocardiographic variables and the 30-days mortality and the postoperative neurologic and cardiovascular complications