The relationships between the stand-by time within 24 hours for hip fracture repair and postoperative agitation or early gait training: a propensity score analysis

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Background and Goal of Study

Hip fracture is a major public health problem in the elderly because of its high incidence, the high related mortality and morbidity, the loss of functional independence, the diminished quality of life. In addition, postoperative agitation or hyperactive delirium is one of the main concerns after hip surgery and induces a negative outcome. Our institute provides "fast track" hip fracture surgery within twenty-four hours after admission in hospital. We hypothesized that the prompt procedures for hip fracture surgery decreased the incidence of agitation or hyperactive delirium and improved the rehabilitation status, especially in early standing and ambulation abilities.

Materials and methods

Study design: Retrospective chart review
Approval of IRB: Institutional review board (No.2016-015)
Subjects: Six hundred patients underwent hip fracture repair between January 2012 and November 2016. Five patients aged 50 years and younger was excluded.
Study protocol:
The fractures were divided with the following two types; inter-trochanteric or femoral neck fractures. Patients received internal fixation, hip-compression screw or hemi-arthroplasty.
Collected the patients' data as follows; History of diabetes mellitus (DM), history of brain infarction (BI), history of hemodialysis on chronic renal failure (HD), neurological disability (paralysis, motor disturbance, failure of sensory organs), single-living (not living with family or utilizing nursing home), patients' status, intraoperative data, postoperative rehabilitation status (time points of standing and ambulation). Patients received general anaesthesia (including combined regional anaesthesia.), or spinal anaesthesia.
The "dementia" was defined as follows; 1. already diagnosed dementia by the other medical institutions, 2. diagnosed dementia by the psychiatrist in our institution, 3. strongly suspected dementia from the clinical symptoms and evaluated by the Hasegawa dementia scale for revised (HDS-R) under 20 points.
The hyperactive delirium or agitation was defined as follows; Richmond Agitation-Sedation Scale (RASS) +1 to +4
Stand-by time was defined as follows; the hours during admission to the orthopaedic wards and entering operation theatre
Analysis:
Propensity score analysis with 1:1 matching was performed using modeling a logistic regression model in which the dependent variable was whether the patient was received surgery within 24 hours. The independent variables were **gender, age, body mass index (BMI), ASA status, typical medical history including BI, DM, HD and neurological disability), single living, surgery type, anesthesia type, preoperative diagnosis of dementia.**

The multivariable regression model of propensity for patients received surgery within 24 hours had a C-statistic of **0.63** [95% confidence interval (CI): 0.59-0.68].
Study outcome:
Endpoints were
(1) Postoperative agitation, (2) Postoperative standing and gait ability.
Statistical analysis:
R 2.1.9 for windows (R project, Wien, Austria) was used for this study. The difference in baseline characteristics and comorbid variables between the two cohorts were evaluated using Student *t* test for continuous variables and Pearson chi-square tests for categorical variables. The odds ratio (OR) and 95% CI were calculated using conditional logistic regression without further adjustment because the potential confounding factors were bundled by propensity score matching. No *a priori* power calculations were conducted because this study is a retrospective study. To account for multiple outcome testing, Bonferroni correction was adopted. Significance was set at P values less than 0.166 (*i.e.*, 0.05/3).

Result

The 295 patients per each group was matched. In our two propensity score-matched cohorts, Early group patients had a greater percentage and higher odds of postoperative standing and gait abilities on postoperative day 1 (Early versus Delayed: **n= 234 versus n=202** respectively, **odds ratio 1.8, 95% CI: 1.2 to 2.6, p=0.004**), whereas there were no statistical difference in postoperative agitation during patients groups (Early versus Delayed : **n=72 versus n=83, odds ratio 0.82, 95% CI: 0.56 to 1.19, p=0.35**).

Matching Group	Pre_score_matching			Post_score_matching		
	Early (n=295)	Delayed (n=300)	p	Early (n=295)	Delayed (n=295)	p
Preoperative_waiting_time (hour)	14.2±7.5	64.7±39.1	<0.01	14.2±7.5	64.4±39.0	<0.01
Age	82±10	83±8	0.33	82±10	83±8	0.35
Gender(F/M)	208/87	222/78	0.36	208/87	220/75	0.31
ASA(1/2/3)	5/271/19	2/270/28	0.25	5/271/19	2/269/24	0.41
BMI	20.5±3.2	20.7±3.6	0.35	20.5±3.2	20.8±3.6	0.3
Preoperative_dementia (Y/N)	124/171	116/184	0.41	124/171	114/181	0.45
History of DM(Y/N)	79/216	81/219	1	79/216	78/217	1
History of HD(Y/N)	11/284	14/286	0.68	11/284	14/281	0.69
History of BI(Y/N)	65/230	55/245	0.26	65/230	55/240	0.36
Neurological disability(Y/N)	78/217	78/222	0.93	78/217	78/217	1
Single_living(Y/N)	27/268	41/259	0.09	27/268	41/268	0.09
Surgery type (BHA/Nailing/Pinning)	99/190/6	154/136/10	<0.01	99/190/6	149/136/10	<0.01
Anesthesia type (General/Spinal)	149/146	139/161	0.33	149/146	137/158	0.37
Postoperative_agitation (Y/N)	72/223	84/216	0.35	72/223	83/212	0.35
Standing_Rehabilitation on POD1(Y/N)	234/61	605/95	0.002	234/61	202/93	0.004

Discussion

Our retrospective data revealed the evidence that shorter stand-by time within 24 hours for hip fracture surgery improved the postoperative early standing and gait abilities on POD1, however we could not avoid the postoperative agitation and hyperactive delirium and intraoperative transfusion.
Past study indicated that delaying surgery in hip fracture patients led to an increased stay of 0.75 days in the orthopedic ward for each day of delay.¹ Preoperative and early postoperative immobilization due to hip fractures would induce a severe decline in muscle mass, strength and function. Our data suggests that the shortage of stand-by time for hip fracture surgery would prevent the muscle atrophy and be possible to make advance in the postoperative gait rehabilitation. However our data could not present the association between early hip fracture surgery and hyperactive delirium. Past trial argued that incident postoperative delirium was not significantly associated with decreased survival in elderly patients undergoing hip fracture repair.² Another retrospective cohort study at rural region in Japan, which was similar situation to our study, argued that there were a very close correlation between patients' gait function and dementia.³

Conclusion

There is a certain tendency that patients who received hip fracture surgery with shorter stand-by time within 24 hours could attain the earlier gait function however could not be prevented the postoperative hyperactive delirium.

Reference

1. Alonso-Fernández P, et al. Int J Health Plann Manage. 2016 May 2. doi: 10.1002/hpm.2353.
2. Gottschalk A et al. Anesth Analg. 2015;121:1336-43.
3. Yoshii I et al. J Orthop Sci. 2016;21:481-6.