

# The Risk Factor to Contribute to Mortality within 30 Days after Hip Fracture Surgery

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**DISCLOSURES:** The authors have no conflicts of interest.

**INTRODUCTION:** The number of proximal hip fracture in elderly patients have increased every year because of super-aged society in Japan. Many studies recommend “early surgery” for proximal hip fractures in order to prevent complications, shorten duration of hospitalization and decrease mortality after fracture<sup>1,2)</sup>. However, some patients cannot undergo the early surgery due to their underlying diseases. Thus, we need screening tools to confirm the general condition in accurately and quickly. Brain natriuretic peptide (BNP) is one of the biomarkers to diagnose acute/chronic heart failure. BNP also related with mortality of septic and hemodialytic patients in previous reports<sup>3,4)</sup>. We hypothesized that BNP was one of the valuable tools to reflect their general conditions including cardiac function, infection, renal disease and so on. The aim of this study was to investigate prognostic factor of perioperative death in patients with hip fracture.

**METHODS:** We retrospectively analyzed the clinical data of patients with proximal hip fracture during April 2017 to March 2021 in our department. Some patients who underwent conservative treatment or had never visit our hospital after hip fracture surgery were excluded from our criteria. Eventually 805 patients were included in our study and were divided into two groups: whether patients died within 30 days or survived. Evaluation categories included patient’s background (age, sex, BMI, ADL), Charlson’s Comorbidity Index (CCI), time to surgery, operation time, blood loss and serum data at admission (BNP, Alb, Cre, CRP, WBC, Hb, Plt). Two groups were compared with Mann-Whitney’s U test for measurement variables and Fisher’s exact test for numerical variables. Risk factors for death within 30 days after surgery were analyzed with on-conditional logistic regression analysis. Receiver Operating Characteristic (ROC) analysis was performed for items that showed significant difference in multivariable analysis. Significance was set at  $P < 0.05$  (EZ version 1.55 for Windows, Saitama, Japan).

**RESULTS:** The median age of participants was 86 [range: 41-101] years old and 597 (74.2%) patients were female. The fracture type included 457 (56.8%) femoral trochanteric fractures and 348 (43.2%) femoral neck fractures. The median time to surgery was 48 [4-1080] hours and 443 (55.0%) patients achieved early surgery (within 48 hours). Overall, 10 (1.2%) patients passed away within 30 days after hip fracture surgery. As a result of univariate analysis to compare between two groups, statistically significant differences were in BMI, ADL, CCI, BNP, Alb and Cre. There were no significant differences between the two groups with age, sex, time to surgery, operation time, blood loss, CRP, WBC, Hb and Plt. On the other hand, multivariate regression analysis showed BNP (OR: 1.84, 95% CI: 1.10-3.08,  $p=0.021$ ) was the only item having a significant different in death after hip fracture surgery (**Figure1**). ROC analysis showed the cut-off values of BNP was 176.1 pg/mL (Sensitivity, 0.750; Specificity, 0.856; area under the curve, 0.853) (**Figure2**).

**DISCUSSION:** BNP could be useful in forecasting mortality within 30 days after hip fracture surgery. Our study revealed it was important to measure the BNP at the time of hospitalization. The patients who elevated BNP level may have to be checked and corrected for cardiac function regardless of the best policy of early surgery. Limitations of our study are the retrospective data and low mortality after surgery. If the number of perioperative deaths is high, the data may be effect to some variables statistically. In conclusion, BNP is associated with perioperative death after hip fracture surgery.

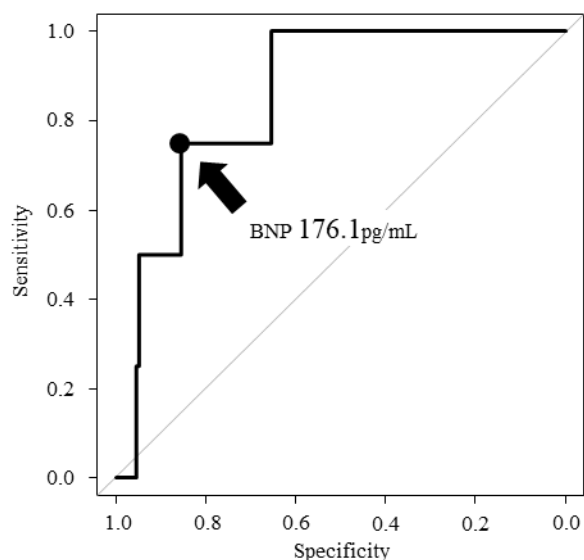
**SIGNIFICANCE/CLINICAL RELEVANCE:** The mortality within 30 days after hip fracture surgery increased in BNP above 176.1 pg/mL. BNP is useful tool to be confirmed conveniently using serum data.

## REFERENCES:

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Indicator	Odds ratio	95% confidence interval	p-value
BMI	0.72	0.48-1.08	0.12
ADL	1.66	0.80-3.43	0.17
CCI	1.19	0.63-2.26	0.59
BNP (OR per 100 pg/mL)	1.84	1.10-3.08	<u>0.021</u>
ALB	0.82	0.11-6.09	0.84
Cre	0.78	0.18-3.34	0.74

**Figure1:** Logistic regression analysis shows that BNP is the only item to have a significant correlation with mortality after hip fracture surgery.



**Figure2:** ROC analysis shows the cutoff value of BNP is 176.1 pg/mL. Sensitivity is 0.750, specificity is 0.856 and area under the curve is 0.853.