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## High energy injury is a risk factor for preoperative venous thromboembolism in the patients with hip fractures: A prospective observational study

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### ABSTRACT

**Background:** The purpose of this study was to identify the incidence of preoperative venous thromboembolism (VTE), and determine if high energy hip fracture affects preoperative VTE occurrence. **Methods:** Three-hundred nine patients (244 low and 61 high energy injuries) treated between March 2015 and March 2017 were included in this study. Indirect multidetector computed tomographic venography for the detection of preoperative VTE was performed at admission. The incidence of preoperative VTE was compared between high and low energy injury hip fractures. Logistic regression analysis was used to identify independent risk factors for preoperative VTE.

**Results:** The overall incidence of preoperative VTE was 18.4% (56 of 305 patients). Preoperative VTE was identified in 17 (27.9%) and 39 (16.0%) patients in the high and low energy injury groups, respectively ( $p = 0.034$ ). Multivariate logistic regression analysis showed that high energy injury, history of VTE, and myeloproliferative disease were significant predictive factors of preoperative VTE (OR = 2.451; 95% CI = 1.227–4.896, OR = 11.174; 95% CI = 3.500–35.673, OR = 6.936; 95% CI = 1.641–29.321, respectively).

**Conclusion:** Because high energy hip fracture is significantly associated with preoperative VTE occurrence, preoperative evaluation and proper thromboprophylaxis should be performed for patients with a high-energy hip fracture.

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### Introduction

When a hip fracture occurs, venous congestion due to tissue edema around the fracture site, vascular injury due to the trauma, and immobilization due to the fracture put patients at high risk of venous thromboembolism (VTE) in the preoperative period [1,2]. Although there are previous studies about the initiation of thromboprophylaxis in major orthopaedic surgery, debates still remain regarding the safety and efficacy of preoperative thromboprophylaxis. Furthermore, the necessity of preoperative thromboprophylaxis in patients with hip fracture was not properly discussed in these earlier studies, because the study samples included patients with osteoarthritis, rheumatoid arthritis, and osteonecrosis of the femoral head who were able to ambulate in the preoperative period [3–5].

Previous studies reported that the incidence of preoperative deep vein thrombosis (DVT) in patients with hip fracture was from 2.6 to 17.3% using preoperative screening, including Doppler ultrasonography or venography with or without computed tomography (CT), and could be as high as 62% particularly in patients with hip fracture whose operation was delayed more than 2–3 days [6–10]. Study findings suggest that preoperative investigation for VTE should be considered for patients in whom operation is delayed. However, these studies did not properly consider injury mechanism of the hip fracture, even though there may be large differences in preoperative details between high- and low-energy hip fractures. Furthermore, to our knowledge, there are few studies regarding the association between VTE occurrence and injury mechanism. Because most hip fractures tend to occur in elderly patients with osteoporosis after low-energy injury, the incidence of hip fracture due to high-energy injury in previous studies seemed to be insufficient to conduct an investigation on VTE occurrence.

The purpose of this study was to identify the incidence of preoperative VTE in a tertiary hospital having a level I trauma

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center, and determine if high energy hip fracture affects preoperative VTE occurrence. We hypothesized that there are significant differences in the incidence of preoperative VTE between high- and low-energy hip fractures, and that high energy hip fracture affects preoperative VTE occurrence.

**Materials and methods**

*Study population*

This study followed the guidelines of the Declaration of Helsinki, and institutional review board approval was obtained. This prospective observational study was conducted in a tertiary university hospital having a level I trauma center. Between March 2015 and March 2017, 347 patients with hip fracture presented at

our trauma center. The inclusion criterion was hip fracture receiving surgical treatment at our hospital. The exclusion criteria were patients (1) with incomplete medical records, (2) who did not receive a contrast-enhanced CT, (3) who did not receive chemical prophylaxis, and (4) who had a pathologic hip fracture.

*Study protocol*

All patients received mechanical prophylaxis for preoperative VTE using an intermittent foot pump started at the time of admission, and continued during hospitalization. Surgical timing was based on the patient's comorbidities and medical condition after acute trauma. If there was no opportunity to optimize the medical condition or decrease the risk for perioperative complications, surgery was performed as quickly as possible. Indirect

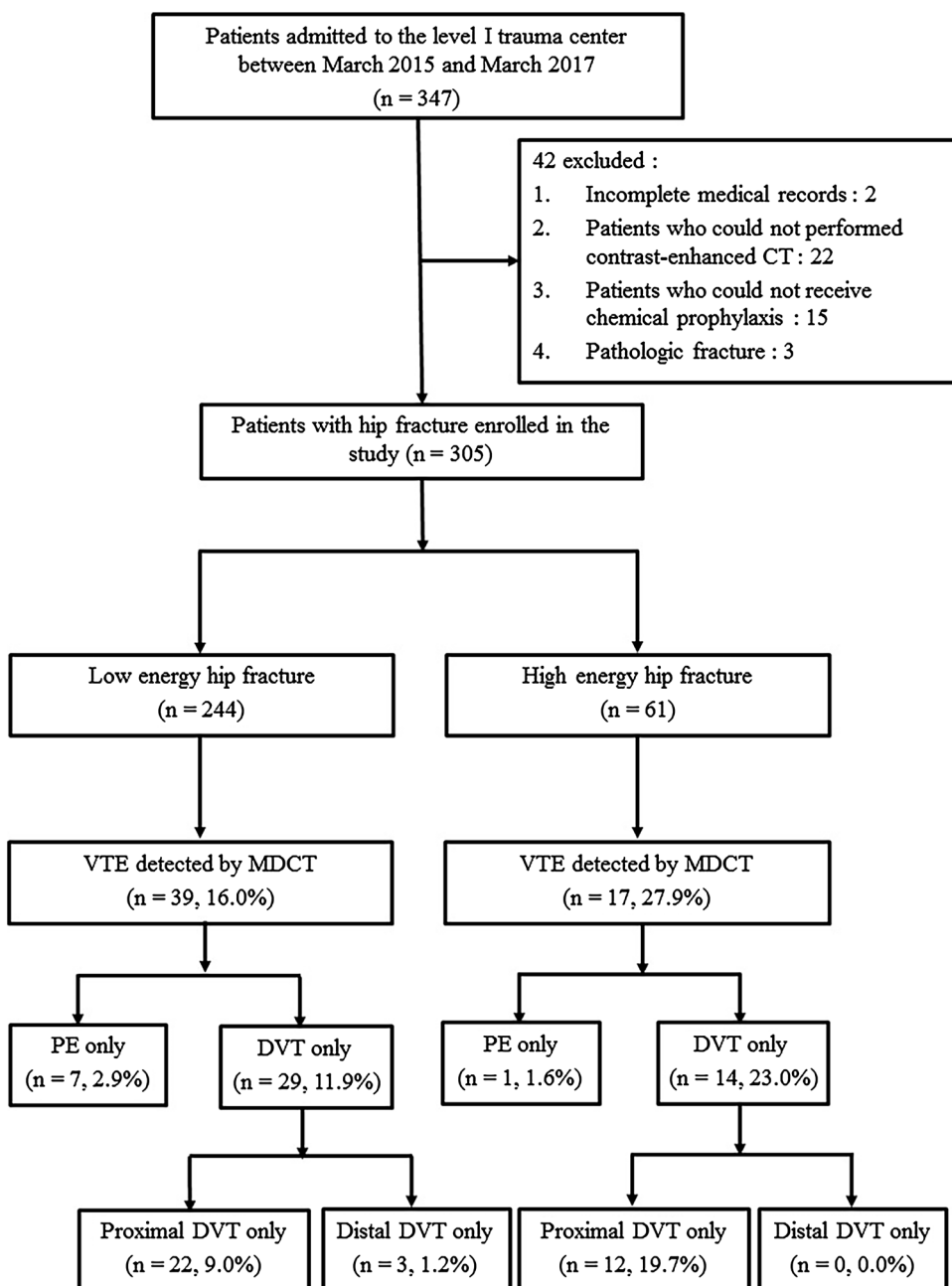


Fig. 1. Flow chart of the patients.

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