



Deep Vein Thrombosis Prophylaxis after Total Hip Arthroplasty in Asian Patients

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In Western patient populations, the reported incidence of imaging-demonstrated deep vein thrombosis (DVT) after total hip arthroplasty (THA) is as high as 70% without prophylaxis. The reported rates of symptomatic pulmonary embolism (PE) after THA in recent studies range from 0.6% to 1.5%, and the risk of fatal PE ranges from 0.11% to 0.19% in the absence of prophylaxis. Predisposing factors to DVT in western patients include advanced age, previous venous insufficiency, osteoarthritis, obesity, hyperlipidemia, dietary and genetic factors. However, Asian patients who have undergone THA have a strikingly low prevalence of DVT and virtually no postoperative PE. Some authors suggest low clinical prothrombotic risk factors and the absence of some DVT-related genetic factors in Asian patient populations decrease the risk of DVT, PE or both. In Korea, the prevalence of DVT after THA without thromboprophylaxis have ranges from 6.8% to 43.8%, and asymptomatic PE have ranges from 0% to 12.9%; there have been only two reported cases of fatal PE. Deep-wound infections resulting from postoperative hematomas or prolonged wound drainage have been reported with routine thromboprophylaxis. The prevalence of DVT differs varies based on patient ethnicity. Guidelines for the use of thromboprophylaxis were altered and focus on the potential value of outcomes compared with possible complications (e.g., bleeding).

Key Words: Total hip arthroplasty, Deep vein thrombosis, Pulmonary embolism, Prophylaxis, Asians

INTRODUCTION

Deep vein thrombosis (DVT) and pulmonary embolism (PE) are serious complications after total hip arthroplasty

(THA). In Western populations, the incidence of DVT after THA is reportedly as high as 70% without prophylaxis¹⁾. Recently reported rates of symptomatic PE after THA range from 0.6% to 1.5%, and the risk of fatal PE ranges from 0.1% to 0.19% without prophylaxis^{2,3)}.

Predisposing factors for DVT in Western patients include age over 60 years, previous venous insufficiency, obesity, dehydration, one or more comorbidities, hyperlipidemia, concomitant use of oral contraceptives, cancer, dietary factors, genetic factors and others⁴⁻⁶⁾. On the contrary, Asian patients have a strikingly low prevalence of DVT and virtually no postoperative PE after THA⁷⁻¹⁰⁾. Some authors have suggested that Asian populations have low clinical prothrombotic risk factors for DVT and the absence of some genetic factors involving in DVT^{9,5,11)}.

In Korea, the reported prevalence of DVT after THA without thromboprophylaxis ranges from 6.8% to 43.8%,

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and PE is reported to occur at rates between 0% and 12.9%-mostly asymptomatic. To date, only two cases of fatal PE have been reported^{12,13}. Routine use of thromboprophylaxis with anticoagulants has been associated with an increased rate of complications including deep-wound infection caused by postoperative hematoma or prolonged wound drainage.

This study aimed to explore the difference in DVT incidence rates between Asian and Western populations through a literature review and to identify updates to the guidelines for prevention of venous thromboembolism (VTE) to balance the relationship between prophylactic treatment and adverse drug events.

MAIN DISCUSSION

1. Prevalence of DVT and PE

Many publications have supported the use of prophylactic anticoagulant therapy because a decreased rate of DVT after THA can lower the incidence of PE, mortality and prevalence of postphlebotic syndrome¹⁴⁻¹⁶.

Johnson et al.¹⁷ reported a prevalence of symptomatic PE after THA of 8% without thromboprophylaxis; there was a mortality rate of 1% associated with these cases of PE. Interestingly, the prevalence and mortality rates of PE have been reported to gradually decrease over time. Freedman et al.¹⁸ and Murray et al.¹⁹ reported that the rates of DVT after THA were similar irrespective of whether prophylactic treatment was provided. The prevalence of asymptomatic PE ranged from 12.6% to 18.9% and symptomatic PE occurred only in 1.9% among patients who underwent THA. The rate of fatal PE ranged between 0% and 0.32% irrespective of prophylactic drug therapy^{19,20}.

2. Differences in the Prevalence of DVT and PE in Asians, Including Koreans

Asian patients have been reported to have a lower prevalence of DVT and PE after THA compared with Western patients^{8,10,21-24}. In the report by Klatsky et al.⁹, the prevalence of DVT and PE in Asian populations was estimated at 20% of the Western population.

Woo et al.²⁵ noted that the incidence of PE among the Chinese population in Hong Kong was only 10% of the incidence rate observed within Western populations; those Chinese patients in Hong Kong with PE exhibited symptoms that were milder relative to those observed in Western populations.

In a study on DVT in Korean patients, the prevalence of DVT without thromboprophylaxis ranged from 6.8% to 43.8%, and Yoo et al.¹³ reported that symptomatic DVT rates were 8% and 20.7% in two different studies, respectively. The rate of asymptomatic PE was 12.9%. Hwang et al.¹² and Yoo et al.¹³ reported a single case of symptomatic PE in each study, respectively. In both cases, the patient died. In the study published by Hwang et al.¹², the patient received prophylactic dextran.

Kim et al.⁷ reported that the low prevalence of DVT and PE is attributable to low prevalence of venous disease, low obesity rate, low prevalence of hyperlipidemia, early postoperative exercise, and thrombosis mostly restricted to the veins of the lower limb. A low incidence of DVT and PE in Asian patients can be explained by variations in lifestyles, diet and genetic factors^{11,26,27}.

Westrich et al.⁵ stated the presence of the *prothrombin G20210A* gene mutation and a decreased antithrombin-III level were significantly correlated with the occurrence of PEs.

Salvati et al.²⁸ reported that about 50% of patients with VTE after THA had heritable thrombophilia, indicating inherited deficiencies of antithrombin III and protein C or prothrombin gene mutations. Therefore, preoperative tests for these three genetic risk factors may help judge the degree of thromboprophylaxis.

Wähländer et al.²⁴ screened 1,600 patients and noted a tendency for increased risk of VTE and PE with the presence of a mutation in the prothrombin promoter region and factor V Leiden mutation.

Westrich et al.⁵ reported that the risk of developing PE reached almost 100% when antithrombin levels were lower than normal and the *prothrombin promoter G20210A* mutation was present.

Zivelin et al.⁶ identified that the *prothrombin G20210A* mutation led to elevated levels of factor II and was associated with a 2- to 5-fold increased risk for VTE; this mutation is present in 1% to 6% of the Caucasian population and rare in other populations.

According to Balasa et al.²⁶, the *prothrombin G20210A* mutation is found in 4% to 6% of Caucasians and associated with an approximately 3-fold increased risk of VTE in persons with heterozygous forms of the mutation, and 20-fold risk in persons with homozygous inheritance.

3. Complications of Anticoagulant Thromboprophylaxis

Routine thromboprophylaxis-via administration of antithrombotic agents-may cause surgical wound hematomas, bleeding, skin necrosis, thrombophilia, or bleeding in the gastrointestinal tract or urinary system^{3,27,28}.

Parvizi et al.^{29,30} reported that the use of low-dose warfarin or heparin may elevate the average international normalized ratio to 1.5 or higher and increase the risk of wound infections due to postoperative hematomas or prolonged wound drainage. Higher incidences of wound complications (e.g., hematomas or delayed wound drainage) occurred after intravenous administration compared with use of oral antithrombotic agents^{31,32}.

Patel et al.³³ suggested an association between prolonged wound discharge with infections after THA and each day of prolonged wound drainage increased the risk of wound infection by 42%.

Although it is rare, the use of antithrombotic agents such as low molecular weight heparin can restrict regional anesthesia for prevention of spinal cord compression and paralysis following epidural hematoma or epidural catheterization for management of postoperative regional pain⁶.

4. Revised Guidelines for VTE Prevention

The American College of Chest Physicians (ACCP) published the guidelines for prevention of thrombosis in 1992, and it has since been updated. Thromboprophylaxis is strongly recommended for both THA and TKA in the ACCP guidelines. However, the new ACCP guidelines for prevention of thrombosis (9th edition, released in 2012) has focused on preventing symptomatic DVT and PE, and has restricted the use of prophylaxis in patients at a high risk of bleeding³⁴.

In Journal of Arthroplasty in 2005, Callaghan et al.³⁵ opined whether recommendations from the ACCP are appropriate for orthopaedic surgery. Since then, the American Association of Orthopaedic Surgeons (AAOS) developed its own thromboprophylaxis guidelines appropriate for orthopaedic surgery in 2007; an updated version published in 2011 consists of 10 recommendations classified as strong, moderate, weak, inconclusive and consensus based on the levels of evidence^{35,36}.

Considering the difference in prevalence of DVT and PE in Korean patients and adverse effects of anticoagulant drugs, the Korean Hip Society generated guidelines in 2011 for the

use of DVT prophylaxis for both THA and hip fracture surgery according to DVT and bleeding risk factors⁴.

General recommendations are as follows:

- 1) All patients undergoing THA are recommended to be assessed preoperatively for risk of VTE and bleeding to choose appropriate VTE prophylaxis.
- 2) Regional anesthesia is recommended in consultation with anesthesiologists.
- 3) The use of anticoagulants should be stopped immediately in patients suspected of anticoagulant-related excessive bleeding.
- 4) All patients are recommended to ambulate as early as possible postoperatively for the prevention of VTE.
- 5) Patients and their family members are recommended to be educated about the clinical signs of VTE before discharge from the hospital and to visit the hospital immediately after the onset of these symptoms.

In cases of delayed surgery, the concurrent use of drug therapy and physical prophylaxis before surgery is strongly recommended in hip fracture patients at high risk of VTE in our aging society.

SUMMARY

DVT and PE-potential complications following THA-can be life-threatening, but fortunately, the reported prevalences of DVT and PE are low in Asians and Koreans because of relatively low obesity rates and serum lipid levels, and differences in ethnicity related genetic factors.

Considering complications of routine thromboprophylaxis (e.g., bleeding, hematoma, skin necrosis and infections), it would be more reasonable to use thromboprophylaxis depending on the individual needs of a patient (e.g., medical history and conditions), rather than following the guidelines for Western patients.

Anticoagulants for thromboprophylaxis cannot be easily used in many artificial joint patients who may experience complications due to routine use of thromboprophylaxis with anticoagulants, although not required, but only to avoid uncommon fatal PE.

Fortunately, the recommendations for VTE prophylaxis have been updated and the VTE prevention guidelines recommended by the Korea Hip Society are expected to serve as guidance for the appropriate treatment of Asian populations including Koreans.

CONFLICT OF INTEREST

The author declares that there is no potential conflict of interest relevant to this article.

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