

# Deep Vein Thrombosis in Foot and Ankle Surgery



John Chao, MD

## KEYWORDS

• Foot and ankle • Venous thromboembolism • DVT • Pulmonary embolism

## KEY POINTS

- The incidence of venous thromboembolism is reported to be low regarding elective and traumatic foot and ankle procedures.
- There is scarce literature offering high-level recommendations for or against venous thromboembolism prophylaxis.
- Although venous thromboembolism can be a devastating complication of treatment of foot and ankle conditions, there are also significant risk factors associated with chemical prophylaxis.
- Most articles suggest considering a chemical prophylaxis in high-risk individuals.
- The ultimate decision of using chemical prophylaxis must be a discussion between the physician and the patient.

## INTRODUCTION

Deep vein thrombosis (DVT) is a frequent complication after elective orthopedic surgery and can be a significant cause of morbidity and mortality. Although the incidence of DVT after foot and ankle surgery is low, a DVT leading to pulmonary embolism (PE) can be a cause of mortality. Commonly used DVT prophylaxis includes early mobilization, foot pumps, compression stockings, and chemical prophylaxis.<sup>1</sup> Many of the recommendations for DVT prophylaxis after foot and ankle surgery have been extrapolated from the total joint arthroplasty literature. The incidence of DVT after hip and knee surgery can be more than 60%, with up to 13% subsequently having pulmonary emboli.<sup>2</sup> Despite the benefits of chemical prophylaxis, chemical prophylaxis can be costly and cause wound healing complications.<sup>3</sup> Risk factors should be taken into consideration when discussing potential chemical prophylaxis. Unfortunately, there are several risk factors that make preoperative screening for venous thromboembolism (VTE) more difficult. Some risk factors include

family or personal history, older age, immobilization, stroke, cancer, lengthy surgical procedure, air travel, cigarette smoking, and oral contraceptives.<sup>4–11</sup> The decision for DVT prophylaxis should be individualized for each patient after foot and ankle surgery.

## VENOUS THROMBOEMBOLISM PROPHYLAXIS

The 2 main categories of VTE prophylaxis are mechanical and chemical. Mechanical prophylaxis includes compression stockings, ambulation, and intermittent pneumatic compression devices. Even if a patient is casted postoperatively, a weight-bearing cast may allow for muscle contraction and decrease the risk of DVT. Chemical prophylaxis includes aspirin, warfarin, low-molecular-weight heparins (LMWH, ie, Enoxaparin), and direct Xa inhibitors (ie, rivaroxaban). Although the use of direct Xa inhibitors is increasing in joint replacement patients, limited literature exists for the direct Xa inhibitors, especially in foot and ankle surgery.

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Department of Orthopaedic Surgery, Peachtree Orthopaedic Clinic, 5505 Peachtree Dunwoody Road, Suite 600, Atlanta, GA 30342, USA

E-mail address: [jchao@pocatlanta.com](mailto:jchao@pocatlanta.com)

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Because the literature is poor regarding DVT prophylaxis in foot and ankle surgery, extrapolations have been used from joint replacement literature. Newer literature has suggested that aspirin is an appropriate agent for chemical DVT prophylaxis in total joint patients. In patients undergoing total joint arthroplasty, symptomatic thromboembolic events were lower in patients receiving 325 mg aspirin twice a day versus patients receiving warfarin.<sup>12</sup> Pulmonary embolism rates were 0.14% in the aspirin group versus 1.07% in the warfarin group ( $P < .001$ ). The aspirin group also had significantly fewer symptomatic DVTs, less wound related problems, and shorter related hospital stays.

Aspirin has also been studied in foot and ankle patients. However, the dosage and frequency of aspirin was much lower than what is recommended for a postoperative arthroplasty patient. In a study of VTE in foot and ankle surgery, placebo was compared with 75 mg of aspirin a day.<sup>13</sup> The overall incidence of VTE was 0.42%, but there was no protective mechanism by this aspirin dose. The authors concluded that incidence of VTE is low, and chemical prophylaxis does not seem to be necessary if the patient is not high risk.

## RISKS OF THROMBOPROPHYLAXIS

It is important to understand that mechanical and chemical DVT prophylaxis may decrease the incidence of VTE but does not make the risk zero. Risks of VTE prophylaxis, albeit low, sometimes outweigh the benefit of prophylaxis. In multiple studies, warfarin and LMWH have increased wound complications and superficial and deep infections.<sup>12,14</sup> Warfarin has many food and drug interactions, requiring frequent monitoring and dose adjustments. In patients who do not adhere to a strict diet, international normalized ratio levels may fluctuate significantly.

Heparin-induced thrombocytopenia (HIT) is also a serious complication with absolute risk in orthopedic surgery of 0.2% for LMWH and 2.6% for unfractionated heparin.<sup>15</sup> HIT often manifests 1 to 2 weeks after initiation of therapy but may occur as early as 1 to 2 days.<sup>16,17</sup> It is identified by significant decrease in platelet count and positive HIT panel, and treatment involves cessation of heparin products and consultation with a specialist.

## RISKS FOR VENOUS THROMBOEMBOLISM

Any factors increasing hypercoagulation, venous stasis, or endothelial vessel damage increase the risk for thrombosis. The preoperative evaluation of each patient should consist of an evaluation of postoperative VTE risk. Previous history of DVT,

obesity, increasing age, cigarette use, oral contraceptive use, and tourniquet use have been reported as risk factors in differing articles.<sup>4-11</sup> It is also important to ask if there is a family history of DVT and, if there is, whether there was ever a history of hypercoagulation workup.

## TOURNIQUET

In foot and ankle surgery, tourniquets are helpful for maintaining a bloodless surgical field and increasing the ease of surgery. However, the literature is not conclusive about the correlation of DVT and tourniquet use in the foot and ankle. Maffulli and colleagues<sup>7</sup> noted that thrombosis was more common with the use of a tourniquet in operatively treated ankle fractures compared with a control group, but the statistical significance of this increase was not calculated between the 2 groups. Conversely, in a prospective study, Simon and colleagues<sup>18</sup> did not show an increased rate of thrombosis with the use of a thigh tourniquet in 117 patients undergoing forefoot surgery.

## CHEST Guidelines

The American College of Chest Physicians produce recommendations on venous thromboprophylaxis in orthopedic surgery.<sup>19</sup>

- Thirty-five days of chemical prophylaxis should be used in patients undergoing total hip or knee arthroplasty.
  - Includes LMWH, fondaparinux, apixaban, dabigatran, rivaroxaban, unfractionated heparin, vitamin K antagonists, aspirin, or intermittent pneumatic compression device.
- Chemical prophylaxis should start 12 hours or more postoperatively.
- Recommend against Doppler ultrasound screening for asymptomatic patients.
- Inferior vena cava filter may be used for primary prevention in patients with increased bleeding risk or contraindications to chemical/mechanical thromboprophylaxis.
- No prophylaxis for isolated lower leg injury requiring immobilization.

## Foot and Ankle Surgery

Studies evaluating heterogeneous populations after foot and ankle surgery concluded that the risk is low for a thromboembolic event. Each study identified its own risk factors (Table 1).

## Surveys of Practice

Two surveys evaluating the use of DVT prophylaxis after foot and ankle surgery found that most

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