THROMBOPROPHYLAXIS: ORTHOPEDIC SURGERY

Thrombosis Canada
Thrombose Canada

OBJECTIVE:

To summarize a practical approach to the prevention of venous thromboembolism (VTE) in various patient groups undergoing orthopedic surgery or with lower extremity fractures.

BACKGROUND:

Patients undergoing hip arthroplasty, knee arthroplasty, hip fracture surgery, and patients with major lower extremity injuries are at particularly high risk for VTE. In this population, routine use of thromboprophylaxis has been standard-of-care for many years. Before thromboprophylaxis was widely used, deep vein thrombosis (DVT), which was most often clinically silent, occurred in 40-60% of these patients; pulmonary embolism (PE) occurred in 5-10% of patients; and fatal embolism was one of the most common causes of death. The use of evidence-based thromboprophylaxis in these patients has been shown to reduce the risk of DVT by at least 50% and, as a result, major and fatal VTE are now uncommon. A large number of clinical trials have assessed many different thromboprophylaxis modalities in orthopedic surgery.

For patients undergoing major orthopedic surgery, the risk of symptomatic VTE continues for weeks to several months after discharge. Numerous clinical trials have demonstrated that continuing thromboprophylaxis for up to 4-6 weeks in patients with hip or knee arthroplasty or hip fracture surgery reduces symptomatic VTE compared with stopping at discharge.

There is less evidence-based literature guiding thromboprophylaxis in patients who undergo spine surgery, knee arthroscopy, lower limb amputation, and in those with other lower extremity fractures. These groups generally have lower risk of VTE than patients undergoing arthroplasty or hip fracture surgery.

This summary suggests common, effective thromboprophylaxis options. It is not designed to comprehensively discuss all possible options. In some cases, alternative options may also be considered. Given the widespread accessibility of more effective and equally or more convenient alternatives, options based on acetylsalicylic acid (ASA) alone or vitamin K antagonists have not been included.

TABLE: SUGGESTED THROMBOPROPHYLAXIS IN ORTHOPEDIC SURGERY PATIENTS

PATIENT GROUP	THROMBOPROPHYLAXIS OPTIONS*		DURATION
Hip or knee arthroplasty	rivaroxaban apixaban dabigatran enoxaparin dalteparin tinzaparin fondaparinux nadroparin ASA	10 mg PO once daily 2.5 mg PO twice daily 220 mg PO once daily 30 mg SC twice daily or 40 mg SC once daily 5,000 U SC once daily 4,500 U or 75 U/kg SC once daily 2.5 mg SC once daily 38 U/kg SC once daily (day 1-3 post-op), followed by 57 U/kg SC once daily (day 4+ post-op) 81 mg PO once daily, beginning after receiving rivaroxaban 10 mg PO once daily for the first 5 post-op days**	14-35 days
Hip fracture surgery	enoxaparin dalteparin tinzaparin fondaparinux nadroparin	30 or 40 mg SC once daily 2,500 or 5000 U SC once daily 4500 U SC once daily 2.5 mg SC once daily 38 U/kg SC once daily (day 1-3 post-op), followed by 57 U/kg SC once daily (day 4+ post-op)	14-35 days
Major orthopedic trauma	LMWH [enoxaparin 30 mg SC twice daily, dalteparin 5,000 U SC once daily or tinzaparin 4,500 U SC once daily] when hemostasis is evident Mechanical method with IPC or ECS if high risk for bleeding with switch to LMWH when bleeding risk decreases. Inferior vena cava (IVC) filters are not recommended for thrombosis prophylaxis.		Until discharge (including rehabilitation)
Spine surgery: a) Uncomplicated b) Complicated (cancer, spinal cord injury with leg weakness or paralysis, prior VTE, combined anterior/posterior approach)	a) Mobilization alone b) LMWH once daily starting the day after surgery		Until discharge (including rehabilitation)
Isolated below-knee fracture	No prophylaxis if outpatient or overnight hospital stay LMWH once daily if inpatient		Until discharge (including rehabilitation)
Knee arthroscopy: a) low risk b) higher risk (e.g. major knee reconstruction, prior VTE,	a) None b) LMWH once daily or direct oral anticoagulant		5-30 days

PATIENT GROUP	THROMBOPROPHYLAXIS OPTIONS*	DURATION
cancer, other VTE risk factors)		
Lower extremity amputation	LMWH once daily	Until discharge (including rehabilitation)
Other: bedrest, incision & drainage, etc.	LMWH once daily	Until discharge

*Recommendations assume the patient has body weight 40-100 kg and creatinine clearance ≥30 mL/min. Patients outside these parameters may require dosage modification or an alternative prophylaxis method.

Rivaroxaban 10 mg orally per day until post-operative day 5, followed by ASA 81 mg daily for an additional 9 days following total knee arthroplasty or for 30 days after total hip arthroplasty; not evaluated in patients undergoing bilateral arthroplasty and limited evaluation in patients with prior VTE and cancer (see **Use of ASA for extended thromboprophylaxis below).

LMWH = low molecular weight heparin; IPC = intermittent pneumatic compression; ECS = elastic compression stockings

ADDITIONAL SUGGESTIONS:

Start of thromboprophylaxis: For most elective orthopedic surgery patients in whom thromboprophylaxis is recommended, anticoagulant prophylaxis should start approximately 12 hours after surgery (usually the morning after surgery). For hip fracture patients in whom surgery may be delayed, commencing the thromboprophylaxis shortly after admission is suggested. In these cases, thromboprophylaxis should not be given within 12 hours of surgery (particularly if neuraxial anesthesia will be used).

Patients at high risk of bleeding: For patients with high risk of bleeding, we suggest the use of mechanical thromboprophylaxis such as intermittent pneumatic compression devices until it is safe to convert to anticoagulant thromboprophylaxis.

Duration of thromboprophylaxis: Although the optimal duration of thromboprophylaxis is not known for any orthopedic surgery group, extended prophylaxis for 14-35 days is recommended for patients undergoing hip and knee arthroplasty or hip fracture surgery. Therefore, for most of these patients, this implies a period of post-discharge prophylaxis. Within this duration range, we suggest longer duration for patients who are at greater than usual risk for VTE, including those with bilateral arthroplasty, previous VTE, or substantially impaired mobility at discharge. Most orthopedic surgery patients who go to rehabilitation should continue thromboprophylaxis at least until they are discharged from rehabilitation.

Use of ASA for extended thromboprophylaxis: A large randomized controlled trial demonstrated non-inferiority with the use of ASA 81 mg PO once daily vs rivaroxaban 10 mg PO once daily for extended thromboprophylaxis in patients undergoing elective unilateral hip or knee arthroplasty. All patients received rivaroxaban 10 mg PO once daily up to and including post-op day 5 before being randomized to continue with rivaroxaban or switch to ASA. Patients with metastatic cancer were

excluded and less than 3% of the study population had a history of VTE or cancer, which limits applicability to these important subgroups. The risk of major bleeding and all bleeding was similar between ASA and rivaroxaban, suggesting no safety benefit to ASA. Based on patient-preference, it is reasonable to consider the use of ASA for extended thromboprophylaxis in this population.

Pre-discharge Doppler ultrasound: Screening orthopedic surgery patients for asymptomatic DVT is not recommended as studies have not demonstrated a benefit to this strategy. These studies found major bleeding events in the patients treated for asymptomatic DVT.

Pediatrics: Evidence is lacking as to whether thromboprophylaxis is needed in neonates and children who have orthopedic surgery. However, there may be high-risk cohorts in whom thromboprophylaxis may be considered. Consultation with a pediatrician or hematologist with expertise in pediatric thrombosis is recommended.

OTHER RELEVANT THROMBOSIS CANADA CLINICAL GUIDES:

- Acetylsalicylic Acid (ASA)
- Apixaban (Eliquis®)
- Dabigatran (Pradaxa®)
- Rivaroxaban (Xarelto®)
- Unfractionated Heparin, Low Molecular Weight Heparin, and Fondaparinux

REFERENCES:

Anderson DR, et al. Aspirin or rivaroxaban for VTE prophylaxis after hip or knee arthroplasty, N Engl J Med 2018;378:699-707.

Anderson DR, et al. American Society of Hematology 2019 guidelines for management of venous thromboembolism: prevention of venous thromboembolism in surgical hospitalized patients. Blood Advances 2019;3:3898-944.

Camporese G, et al. Efficacy of rivaroxaban for thromboprophylaxis after knee arthroscopy (ERIKA). A phase II, multicentre, double-blind, placebo-controlled randomised study. Thromb Haemost 2016;116(2):349-55.

Canadian Patient Safety Institute. Venous Thromboembolism Prevention. Getting Started Kit. 2017 [http://www.patientsafetyinstitute.ca/en/toolsresources/pages/vte-resources-getting-started-kit.aspx]

Falck-Ytter Y, et al. Prevention of VTE in orthopedic surgery patients: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. Chest 2012;141(2 Suppl):e278S-325S.

Samama CM, et al. Rivaroxaban or enoxaparin in nonmajor orthopedic surgery. N Engl J Med 2020. DOI: 10.1056/NEJMoa1913808

Selby R, et al. Symptomatic venous thromboembolism uncommon without thromboprophylaxis after isolated lower-limb fracture. The Knee-to-Ankle Fracture (KAF) Cohort Study. J Bone Joint Surg 2014;96(10):e83:1-5.

Date of Version: 11May2020

Please note that the information contained herein is not to be interpreted as an alternative to medical advice from your doctor or other professional healthcare provider. If you have any specific questions about any medical matter, you should consult your doctor or other professional healthcare providers, and as such you should never delay seeking medical advice, disregard medical advice or discontinue medical treatment because of the information contained herein.