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. In addition, 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.

Table 1: Suggested Thromboprophylaxis in Orthopedic Surgery Patients

PATIENT GROUP	THROMBOPROPHYLAXIS OPTIONS*		DURATION
Elective hip or knee arthroplasty	rivaroxaban	10 mg PO once daily	14-35 days
	apixaban	2.5 mg PO twice daily	
	dabigatran	220 mg PO once daily	
	enoxaparin	30 mg SC twice daily or 40 mg SC once daily	
	dalteparin	5,000 U SC once daily	
	tinzaparin	4,500 U or 75 U/kg SC once daily	
	fondaparinux	2.5 mg SC once daily	
	ASA	81 mg PO once daily or following rivaroxaban 10 mg PO once daily for first 5 post-op days**	
Hip fracture surgery	enoxaparin	30 or 40 mg SC once daily	14-35 days
	dalteparin	2,500 or 5000 U SC once daily	
	tinzaparin	4500 U SC once daily or 75 U/kg SC once daily	
	fondaparinux	2.5 mg SC once daily	
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.		Until discharge (including rehabilitation)
Isolated below-knee fracture	No prophylaxis if outpatient or overnight hospital stay LMWH once daily (see above for doses) if inpatient		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 (see above for doses) starting the day after surgery		Until discharge (including rehabilitation)
Knee arthroscopy: a) low risk b) higher risk (e.g. major knee reconstruction, prior VTE, cancer, other VTE risk factors)	a) None b) LMWH once daily or direct oral anticoagulant (see above for doses)		5-30 days
Lower extremity amputation	LMWH once daily (see above for doses)		Until discharge (including rehabilitation)
Other: bedrest, incision & drainage, etc.	LMWH once daily or DOAC (see above for doses)		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).

DOAC, direct oral anticoagulant; ECS, elastic compression stockings; IPC, intermittent pneumatic compression; LMWH, low molecular weight heparin; SC, subcutaneous

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: Two recent large trials compared ASA alone to low molecular weight heparin for thromboprophylaxis in various patient groups undergoing major orthopedic surgery or with fractures. A pragmatic, multicenter, randomized, noninferiority trial compared ASA 81mg twice daily to enoxaparin 30mg SC twice daily for thromboprophylaxis in patients with an extremity fracture that was treated surgically or any fracture of the pelvic or acetabulum. A total of 12211 patients with a mean age of 44.6 years were enrolled and the median Injury Severity Score was 9 out of a maximum of 75. Patients with VTE diagnosed in the past 6 months were excluded and less than 1% of patients had a history of VTE. The primary outcome was death from any cause at 90 days and the results demonstrated that ASA was noninferior to enoxaparin. The DVT rates were low in both groups but slightly higher in the ASA group. The rate of major bleeding events was similar between ASA and enoxaparin. In a cluster-randomized, crossover, noninferiority trial, hospitals were randomized to administer ASA 100mg daily or Enoxaparin 40mg SC daily for 35 days after hip arthroplasty and for 14 days after knee arthroplasty. The trial was stopped with 9711 patients of the prespecified 15562 enrolled because the stopping rule was met. The primary outcome was symptomatic VTE within 90 days and ASA did not meet the noninferiority criteria. Based on the findings of these trials, the mortality rate is similar, but thromboprophylaxis with ASA alone is less effective in the prevention of VTE compared with enoxaparin. Given the risk of bleeding is similar and the availability of potentially more effective thromboprophylaxis options, it is reasonable to avoid ASA alone in orthopedic patients who have additional VTE risk factors.

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Patients on long-term anticoagulation: Prophylactic anticoagulant doses should be used postoperatively until it is clinically safe to restart full dose anticoagulation. Generally, this is around 48-72 hours postoperatively. Please see guide **DOACS: Perioperative Management**.

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®)
- DOACS: Perioperative Management
- Rivaroxaban (Xarelto®)
- Unfractionated Heparin and Low-Molecular-Weight Heparin

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