Diseases of the Colon & Rectum

Practice Parameters

Practice Parameters for the Prevention of Venous Thrombosis

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The American Society of Colon and Rectal Surgeons is dedicated to ensuring high quality patient care by advancing the science, prevention, and management of disorders and diseases of the colon, rectum, and anus. The Standards Committee is composed of Society members who are chosen because they have demonstrated expertise in the specialty of colon and rectal surgery. This Committee was created to lead international efforts in defining quality care for conditions related to the colon, rectum, and anus. This is accompanied by developing Clinical Practice Guidelines based on the best available evidence. These guidelines are inclusive and not prescriptive. Their purpose is to provide information on which decisions can be made, rather than dictate a specific form of treatment. These guidelines are intended for the use of all practitioners, health care workers, and patients who desire information about the management of the conditions addressed by the topics covered in these guidelines.

It should be recognized that these guidelines should not be deemed inclusive of all proper methods of care or exclusive of methods of care reasonably directed to obtaining the same results. The ultimate judgment regarding the propriety of any specific procedure must be made by the physician in light of all of the circumstances presented by the individual patient. The evidence-based guidelines are used to categorize each recommendation by Level of Evidence and Grade of Recommendation.

STATEMENT OF THE PROBLEM

The risk of deep vein thrombosis (DVT) is present in all forms of major surgery. Patients undergoing surgery of the colon and rectum are at particularly high risk for DVT and its potentially life-threatening complication of pulmonary embolism (PE). In examining the results of several randomized trials of DVT prophylaxis, the risk of a colorectal surgical patient developing DVT is at least 30 percent compared with approximately 20 percent for general surgery patients.[1] It is easy to overlook the importance of DVT because most episodes are asymptomatic and the incidence of the most dramatic and memorable manifestation—pulmonary embolization—is comparatively infrequent. Furthermore, the potentially devastating complications associated with postphlebitic syndrome typically take years to manifest. In general surgical patients who do not receive prophylaxis, the rate of PE is approximately 2 percent, and it is nearly 3 percent in colorectal surgical patients.[1–3] Nevertheless, PE remains the most common cause of preventable death in hospitalized patients and usually occurs without warning.[4,5] Prophylaxis also reduces the potential morbidity of long-term anticoagulation, chronic venous insufficiency, and pulmonary embolism.

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LEVELS OF EVIDENCE AND GRADE RECOMMENDATION

Level	Source of Evidence
I	Meta-analysis of multiple well-designed, controlled studies, randomized trials with low-false positive and low-false negative errors (high power)
II	At least one well-designed experimental study; randomized trials with high false-positive or high false-negative errors or both (low power)
III	Well-designed, quasi-experimental studies, such as nonrandomized, controlled, single-group, preoperative-postoperative comparison, cohort, time, or matched case-control series
IV	Well-designed, nonexperimental studies, such as comparative and correlational descriptive and case studies
V	Case reports and clinical examples
Grade	Grade of Recommendation
A	Evidence of Type I or consistent findings from multiple studies of Type II, III, or IV
B	Evidence of Type II, III, or IV and generally consistent findings
C	Evidence of Type II, III, or IV but inconsistent findings
D	Little or no systematic empirical evidence

Adapted from Cook DJ, Guyatt GH, Laupacis A, Sackett DL. Rules of evidence and clinical recommendations on the use of antithrombotic agents. Chest 1992;102(4 Suppl):305S–11S. Sacker DL. Rules of evidence and clinical recommendations on the use of antithrombotic agents. Chest 1989;92(2 Suppl):2S–4S.

Unfortunately, there are few published studies exclusively about patients undergoing colorectal surgery. Several studies include large subsets of colorectal surgical patients, but they often are combined with general surgical, orthopedic, gynecologic, or cardiac patients.

ASSESSMENT OF RISK

Although any patient can develop a postoperative thromboembolic event, predicting the risk depends on both clinical characteristics of the patient and the anticipated surgery. Most patients undergoing outpatient anorectal surgery are at minimal risk. These procedures are typically brief, frequently performed with local or light anesthesia, involve only minor tissue trauma, and facilitate early postoperative ambulation. These patients rarely fulfill any of Virchow's pathophysiologic criteria for the development of thromboembolic events, which include venous stasis, venous injury, and hypercoagulability. However, the vast majority of patients undergoing colon resections or laparotomy for bowel-related diseases will fall into a moderate-risk to high-risk category and require some form of VTE (venous thromboembolism) prophylaxis. At the present time, the most widely used risk stratification strategy involves placing a patient in a risk category based on known factors contributing to the likelihood of developing a thromboembolic event. The Seventh American College of Chest Physicians (ACCP) Conference of Antithrombotic and Thrombolytic Therapy[4] presented a practical scheme for classification of risk levels of DVT, identifying four risk groups: low risk, moderate risk, high risk, and very high (or highest) risk. An important component of placing patients in the appropriate risk category is the identification of associated risk factors for VTE. Most of the major risk factors are enumerated in Table 1. This is not a complete list, however, and new predisposing conditions are continually being identified.

Not all risk factors carry equal weight, and no numeric or weighted value system has yet been identified or created that would allow an individualized "risk number." A previous history of VTE is among the highest known risk factors, particularly if it has occurred in the recent past.[6] Most patients will mention an inciting event, such as surgery, hospitalization, or trauma. Patients with a history of venous thrombosis without a precipitating event or with a strong family history of thromboembolic complications are particu-

Table 1.
Risk Factors for Venous Thromboembolism

Surgery
Immobility, paresis
Malignancy
Cancer therapy (chemotherapy, radiation, hormonal)
Previous VTE
Increased age
Pregnancy and postpartum period
Acute medical illness
Cardiac or respiratory failure
Oral contraceptives
Inflammatory bowel disease
Myeloproliferative disorders
Hereditary hypercoagulable states
Obesity
Central venous catheterization

larly worrisome, and may harbor one of the many hypercoagulable states. Hematologic evaluation should be strongly considered in this setting.[7]

Increasing age is a risk factor for VTE, usually starting with older than age 40 years. The risk nearly doubles for each decade of life beyond age 40 years.[8]

Surgery that falls into the category of "major abdominal surgery," "major general surgery," "complicated surgery," or "extensive pelvic surgery," is a risk factor for VTE. Although the descriptors "major" or "extensive" are somewhat nonspecific, they reflect the magnitude of tissue trauma and length of the procedure. Nearly any laparotomy would fit into this category.[9]

Malignancy increases the likelihood of VTE, but this is a complicated association, often incorporating the additional factors of surgery, chemotherapy, and debility. Assessing the precise impact of malignancy alone is difficult.[10] Regardless, the majority of patients with a malignancy fall into the high-risk or very high-risk group.[11]

Based on the above considerations, the four risk categories as described in the ACCP guidelines are as follows:

Low-risk patient

- Minor surgery in a patient younger than aged 40 years *without* additional risk factors.

Moderate-risk patient

- Minor surgery in patients *with* additional risk factors.
- Surgery in patients aged 40 to 60 years *without* additional risk factors.

High-risk patient

- Surgery in patients older than aged 60 years.
- Patient aged 40 to 60 years *with* additional risk factors.

Highest-risk patient

- Surgery in any patient *with multiple* risk factors.

The likelihood of developing VTE based on risk category is summarized in Table 2.

Table 2.
Risk of Thromboembolism in Surgical Patients Not Receiving Prophylaxis

	DVT (%)		PE (%)	
	Calf	Proximal	Clinical	Fatal
Low risk	2	0.4	0.2	<0.01
Moderate risk	10–20	2–4	1–2	0.1–0.4
High risk	20–40	4–8	2–4	0.4–1
Highest risk	40–80	10–20	4–10	0.2–5

DVT = deep vein thrombosis; PE = pulmonary embolism.

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PROPHYLAXIS FOR VENOUS THROMBOEMBOLISM

Physical Measures

Early ambulation is a traditional method of preventing DVT. However, patients after major surgery may not be fully ambulatory until the third or fourth postoperative day. Furthermore, ambulation only addresses one component of risk for VTE: venous stasis. Early ambulation is certainly desirable and useful but is by itself inadequate prophylaxis for patients in the moderate-risk or higher-risk groups especially because many, if not most DVTs, originate intraoperatively.

Elastic stockings are one of the oldest and simplest physical measures used to prevent DVT. Properly fitted, they increase the velocity of blood flow through the femoral veins. They have been shown to be effective in reducing the incidence of venous thrombosis, but only below the knee and only for patients previously at low risk. Because evidence for effectiveness is lacking in moderate-risk or higher-risk patient groups, this modality used alone is inadequate in the higher-risk patient.[12]

Intermittent pneumatic compression (IPC) devices confer protection from VTE by increasing venous blood flow and inducing fibrinolysis. The attraction of this method is the absence of a bleeding risk, which makes it useful when heparin is contraindicated. The disadvantages include the need for proper fitting and appropriate utilization of the device. This requires diligence on the part of the nursing and physician staff to ensure ongoing compliance. IPC should not be used in patients with severe peripheral vascular disease.[13–15] The devices should be applied during the induction of anesthesia and continued during all periods of bed rest during the postoperative period until full ambulation is restored. Studies of the effectiveness of IPC are not nearly as numerous as are those assessing heparin prophylaxis, and no randomized trials have been performed comparing mechanical to heparin prophylaxis in colorectal surgery patients. The studies of IPC in general surgical patients demonstrate a reduction in DVT but not to the extent achieved with heparin.[16–20] Furthermore, no mechan-

ical prophylaxis studies have verified a reduced risk of PE or death when used as the sole means of prophylaxis.[5]

Chemical Measures

Proven anticoagulants include warfarin (Coumadin), unfractionated heparin, and low-molecular-weight heparin. Warfarin is highly effective for the prevention of VTE, but the increased risks of bleeding in surgical patients generally make it an unsafe means of prophylaxis.

Low-dose unfractionated heparin (LDUH) has been available for more than 70 years and has served as a pharmacologic standard for VTE prophylaxis. Initial studies demonstrating effectiveness in preventing both DVT and PE in general surgical patients were reported in the 1970s,[21,22] and numerous subsequent trials have confirmed this benefit. In 1988, a review of more than 70 randomized trials involving >16,000 patients showed a reduction in the incidence of DVT from 22 to 9 percent. The incidence of PE was reduced from 2 to 1 percent, with a concomitant reduction in fatal PE as well.[23] The typical dose is 5,000 units injected subcutaneously two hours before surgery and then repeated at 8-hour to 12-hour intervals postoperatively. Although a recent meta-analysis attempted to determine the best dosing interval, the outcome was inconclusive.[10,24] LDUH is associated with only a modest increase in minor bleeding complications, such as wound hematoma.[23,24]

Low-molecular-weight heparin (LMWH) is made up of fragments of the original heparin molecule, ranging in weight from 3,500 to 6,000 Daltons, depending on the chemical process used to manufacture them. In general, it possesses a better bioavailability and a longer half-life, which confers a more predictable anticoagulant effect. This allows the convenience of once-daily dosing. The primary disadvantage is greater expense. In numerous well-performed studies and several meta-analyses comparing the efficacy of VTE prophylaxis between LMWH and LDUH for VTE prophylaxis, unfractionated heparin has been shown to be equally effective and more cost-effective.[16,23–33]

HEPARIN AND REGIONAL ANESTHESIA

A potential danger has been associated with the use of heparin prophylaxis in conjunction with spinal or epidural anesthesia. This is not an uncommon issue in colorectal surgical patients, in whom such anesthetic techniques are widely applied, both for primary operative anesthesia and as an adjunct for pain control in the postoperative period. The most serious potential complication is the development of a perispinal hematoma, which can lead to create spinal cord ischemia and paraplegia. This complication has been reported with both LDUH and LMWH, but more so with LMWH.[5] Although most of the reported cases were not in the setting of elective surgery, this prompted an FDA alert in 1997[34] with subsequent recommendations regarding the safe use of spinal anesthetic techniques in conjunction with heparin prophylaxis.[35,36] Further elaboration and clarification of recommendations were published in the most recent ACCP Conference publication[5] and are summarized as follows:

1. Insertion or removal of spinal needles or epidural catheters should be done when the effects of anticoagulation are at a minimum. This would be 8 to 12 hours after the last dose of LDUH, or 18 hours after the last dose of LMWH.

2. Initiation of heparin prophylaxis should be delayed if the initial aspirate is hemorrhagic ("bloody tap").

3. Initiation of heparin prophylaxis should be delayed at least 2 hours after removal of an epidural catheter.

4. Patients with indwelling epidural catheters on heparin prophylaxis should be monitored carefully for signs and symptoms of cord compression. These can include progressive lower extremity numbness or weakness, bowel or bladder dysfunction, and new onset of back pain. If cord compression is suspected, prompt radiologic confirmation is required, with neurosurgical consultation.

TREATMENT RECOMMENDATIONS

1. Patients undergoing anorectal procedures who are younger than aged 40 years and have no additional risk factors for VTE require no specific prophylaxis. Level of Evidence: V; Grade of Recommendation: D.

There is no specific data that assesses the VTE risk for anorectal procedures. However, a study of more than 2,000 patients who underwent inguinal herniorrhaphy found a negligible incidence of clinical thromboembolic events.[37] Within this group were patients who possessed one or more risk factors for VTE.

Unprotected, this group of patients has a 2 percent risk of calf vein thrombosis and almost a zero risk of pulmonary embolism.[5]

2. Patients undergoing anorectal procedures who are older than 40 and/or have additional risk factors for VTE should be considered for prophylaxis on a case-by-case basis. Level of Evidence: V; Grade of Recommendation: D.

For patients in this category, there are no studies that specifically address the risk of VTE. Patients in the moderate-risk to high-risk group are appropriately considered for prophylaxis based on the number of risk factors, the length and magnitude of the planned surgery, and the risk of bleeding. The appropriate means of prophylaxis would be mechanical compression or heparin (LDUH or LMWH). Because of the frequent outpatient nature of this type of surgery and the potential for bleeding in many anorectal procedures, mechanical prophylaxis may be preferable in most cases.

3. Patients in the moderate-risk to high-risk categories for VTE undergoing abdominal surgery should receive prophylaxis with unfractionated (LDUH) or low-molecular-weight heparin (LMWH). Patients at risk for bleeding may receive mechanical prophylaxis instead. Level of Evidence: I; Grade of Recommendation: A.

The Canadian Colorectal DVT Prophylaxis Trial specifically compared these two treatments in a multicenter, randomized, double-blinded trial.[1] All patients underwent resective colorectal surgery, and the incidence of DVT was assessed by contrast venography. A total of 936 patients were randomized and evaluated, and there was an equal reduction in DVT, with no deaths from pulmonary emboli in either group. A notable difference between the two treatment arms was a greater incidence of minor bleeding in the LMWH group, but there was no significant difference in major bleeding events. General surgery studies that compared LDUH to LMWH also showed comparable efficacy.[25–33] Numerous other studies have found no clear difference in bleeding risk between LMWH and LDUH.1.[38–43]

Mechanical methods may be chosen in patients in whom the risk of bleeding is judged to outweigh the benefit of prophylactic heparin.

4. Patients in the highest-risk category for VTE should receive both mechanical and heparin prophylaxis. Level of Evidence: I; Grade of Recommendation: A.

In this high-risk group, mechanical prophylaxis adds further protection compared with heparin alone. A recent Cochrane review assessing VTE prophylaxis in colorectal surgery patients concluded that graded compression stockings in conjunction with LDUH offered better VTE prophylaxis than LDUH alone.[44] Although there are no studies of IPC combined with heparin, it seems likely that IPC would offer at least the same additional benefit to heparin prophylaxis as is seen with graded compression stockings.

5. Patients undergoing laparoscopic colorectal procedures should receive VTE prophylaxis according to the same risk assessment that would be applicable for the same surgery performed as an open procedure. Level of Evidence: V; Grade of Recommendation: D.

There is a paucity of information regarding the VTE risk for patients undergoing laparoscopic colorectal procedures. There have been studies of the VTE risk in laparoscopic general surgical patients, but these are primarily patients who underwent laparoscopic cholecystectomy, where the magnitude of the surgery may not be comparable to laparoscopic colorectal procedures. Laparoscopic procedures involve pneumoperitoneum, which impairs venous return and may further increase the risk of DVT.

6. Patients who have undergone major cancer surgery may benefit from posthospital prophylaxis with LMWH. Level of Evidence: II; Grade of Recommendation: C.

The optimum duration of VTE prophylaxis is currently unknown. Although most DVT occurs within the first week or two after surgery, VTE complications, including PE, can occur beyond that time frame.[45–48] These findings combined with shrinking hospital stays have generated an interest in the appropriate duration of VTE prophylaxis. A few studies have assessed prolonged heparin prophylaxis after hospital discharge.[49–51] There is evidence that in cancer-surgery patients, continued prophylaxis for two to three weeks after discharge reduces the incidence of asymptomatic DVT.

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