THE EFFECTIVE PHYSICIAN

Thromboembolism Prevention

BY WILLIAM E. GOLDEN, M.D., AND ROBERT H. HOPKINS, M.D.

Background

The incidence of objectively confirmed deep venous thrombosis in hospitalized patients is at least 10% in general medical and surgical patients and as high as 60% after major orthopedic surgery. Preventive interventions such as thromboembolism prevention are becoming a focus of national quality improvement measures because of the large potential reduction in morbidity and mortality. The September 2004 publication of reports from the Seventh American College of Chest Physicians Conference on Antithrombotic and Thrombolytic Therapy highlights these interventions.

Conclusions

Awaiting signs and symptoms of early DVT in the hope of preventing clinically significant thromboembolic events is not useful. Routine screening is neither effective nor cost effective in most cases.

All hospitalized patients, preoperative patients, and victims of trauma should be assessed for overall risk for DVT and its complications—and most should receive some form of thromboembolism prevention.

Abundant clinical trial data indicate little increased risk of clinically important bleeding with prophylactic low-dose unfractionated heparin (LDUH), low-molecular-weight heparins (LMWHs), and vitamin K antagonists; similarly strong data support their advantageous risk-benefit ratio and cost-effectiveness.

Aspirin alone is not recommended as prophylaxis for any patient group.

Inferior vena cava (IVC) filters are not recommended for routine thromboembolism prophylaxis. Filters (both permanent and "removable" varieties) are indicated only in cases of proven proximal DVT with an absolute contraindication to anticoagulation and/or a short-term plan for major surgery. Therapeutic anticoagulation should be started as soon as considered safe following IVC filter placement.

Mechanical prophylaxis with graded compression stockings or intermittent pneumatic compression devices should be used principally in patients at high risk of bleeding or as an adjunct to anticoagulant prophylaxis.

Implementation

Acutely ill medical patients with heart failure, severe respiratory disease, or cancer and/or those who are bed-bound with one or more additional DVT risk factors should receive prophylaxis with LMWH or LDUH.

Moderate-risk and moderately high-risk general surgery patients should receive prophylaxis with LDUH or LMWH; high-risk patients warrant a combination of mechanical and anticoagulant prophylaxis.

Most patients admitted to an intensive care unit should receive thromboembolism prophylaxis. Mechanical prophylaxis is warranted in patients at high risk of bleeding; otherwise LDUH or LMWH is recommended for moderate-risk patients, and LMWH is recommended for high-risk patients.

All trauma patients with one or more risk factors for thromboembolic disease should receive prophylaxis. LMWH is recommended unless there are major contraindications, in which case mechanical prophylaxis may be used until LMWH is considered safe. Thromboembolism prophylaxis should be continued at least until discharge from an inpatient facility; LMWH or adjusted-dose vitamin K antagonist prophylaxis (target international normalized ratio [INR], 2.5) is warranted as long as the patient has major mobility impairment. Doppler ultrasound screening for DVT is indicated in patients who have received no preventive therapy or suboptimal prevention.

Patients who require surgery for hip fracture should receive anticoagulant prophylaxis with fondaparinux, LMWH, LDUH, or adjusted-dose vitamin K antagonist (target INR 2.5).

In patients who have elective total hip or knee replacement, fondaparinux, LMWH, or vitamin K antagonist prophylaxis is recommended similarly. Thromboembolism prophylaxis should be continued for a minimum of 10 days in orthopedic patients following hip fracture or hip or knee replacement.

Patients undergoing major gynecologic or open urologic procedures should receive prophylaxis with LDUH administered b.i.d. or t.i.d.

Burn patients with any additional risk factors for thromboembolism should be given prophylaxis with LDUH or LMWH as soon as the physician considers it safe.

Thromboembolism prophylaxis other than early mobilization is not recommended for patients undergoing routine laparoscopic procedures. In patients with risk factors, prophylaxis should be implemented as in other general surgery patients.

In all patients undergoing spinal or other neuroaxial anesthesia, anticoagulant prophylaxis should be used with particular caution.

Neither LMWH nor fixed-dose warfarin is recommended for routine prophylaxis against thrombosis of long-term indwelling central venous catheters in cancer patients.

Long-distance travelers with additional risk factors for thromboembolism should avoid constrictive clothing and stretch their calves regularly; long-distance travel is defined as more than 6 hours. If active prophylaxis is considered due to perceived further risk, a single dose of LMWH prior to departure or fitted below-knee graded compression stockings may be used.

Reference

Geerts W.H. et al.: Prevention of venous thromboembolism: The Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. Chest 2004;126 (Suppl. 3):338S-400S.

DR. GOLDEN *is a professor of medicine and public health and* DR. HOPKINS *the associate director of the medicine/pediatrics residency program at the University of Arkansas. Write to Dr. Hopkins and Dr. Golden at our editorial offices or imnews@elsevier.com.*

Hypothermia Devices May Improve Outcomes

BY JANE SALODOF MACNEIL
Contributing Writer

PHOENIX, ARIZ. — Faster patient cooling and more precise temperature control features in the new generation of hypothermia devices may increase the use of hypothermia therapy in stroke and cardiac arrest, Michael A. DeGeorgia, M.D., said at a meeting sponsored by the Society of Critical Care Medicine.

Dr. DeGeorgia, head of the Neurological Intensive Care Program at the Cleveland Clinic Foundation, noted that the equipment used in the influential studies that found hypothermia therapy reduces mortality was slow to achieve cooling and allowed only imprecise temperature control.

Indeed, he said the air-cooled machine used in one Hypothermia After Cardiac Arrest study group trial (N. Engl. J. Med. 2002;346:549-56) is no longer on the market. Median cooling time was 8 hours, and 70% of patients also required ice packs, Dr. DeGeorgia said.

Another favorable experiment, the Cooling for Acute Ischemic Brain Damage (COOL AID) pilot study (Stroke 2001;32:1847-54), for which Dr. DeGeorgia was an investigator, used a technique he said was developed before he was born. "You could achieve the target temperature, but it was very hard. It took about 4 hours," Dr. DeGeorgia said. The emerging technology falls into two broad categories: surface cooling and endovascular cooling, according to Dr. DeGeorgia. Around longer and akin to a cold bath, surface cooling typically employs blankets filled with ice water, alcohol, or cold air. It is simple and cheap, he said.

Shivering can become a problem, however, as skin receptors respond to the cold by setting off muscle tensing to produce heat. As a result, he said anesthesia or a neuromuscular blockade must be used.

Among the disadvantages of surface cooling, he also listed slow cooling, imprecise controls, thermal injury, and use of nursing time.

Promising cold-water surface cooling systems described by Dr. DeGeorgia include:

► Blanketrol II (Cincinnati Sub-Zero Products, Cincinnati) pumps 2 L/min and has a feedback mechanism, temperature control, and random flow patterns to distribute temperature evenly and effectively.

► Meditherm III / MTA 6900 (Gaymar Industries Inc., Orchard Park, N.Y.) pumps 1 L/min, has a feedback mechanism and temperature control, and encircles the patient's legs and torso for maximum surface coverage.

► Arctic Sun Temperature Management System (Medivance Inc., Louisville, Colo.) pumps 0.5-5 L/min under negative pressure, so that the blanket does not become distended and is less likely to leak. It also has a biodegradable, highly conductive inner liner reducing contact resistance.

Endovascular cooling with a cold saline solution is fast and easy enough for paramedics to use en route to the emergency room, Dr. DeGeorgia said. "It seems to be pretty safe. I think it has a future," he said, reporting cooling times in minutes instead of hours.

Among the advantages cited by Dr. DeGeorgia are that endovascular cooling offers precise temperature control, does not require general anesthesia or neuromuscular blockade, and demands less attention from nurses. He listed as disadvantages that it is expensive, invasive, and patients may require intubation in response to airway problems that may develop with prolonged cooling.

New devices use counter-current heat exchange, which circulates the coolant in the opposite direction to blood flow to enhance the effectiveness of endovascular cooling. "The blood gets very cold, and the blood returning to the heart is cooled," he said of one device. "It fakes out the cold receptors on the skin into thinking the body is warm. The body was never designed to be warm on the outside and cold inside."

Dr. DeGeorgia described the following new endovascular cooling systems as promising:

► Reprieve Endovascular Temperature Management System (Radiant Medical Inc., Redwood City, Calif.) places a balloon catheter in the vena cava by way of the femoral vein. A microprocessor-driven controller warms or cools normal saline. The triple-lobed, helically wound balloon creates a large surface area and promotes optimal heat transfer.

► The Cool Line, Icy, and Fortius Systems (Alsius Corp., Irvine, Calif.). Cool Line has a two-balloon catheter that enters the superior vena cava by way of the subclavian vein. Icy has a three-balloon catheter and Fortius a serpentine balloon catheter, both of which go to the inferior vena cava via the femoral vein.

► Celsius Control System (Innercool Therapies Inc., San Diego) has a thin catheter that also goes through the femoral vein to the inferior vena cava. A metal alloy temperature control element on its tip is more conductive than plastic, and an articulated surface promotes blood mixing. ■