Treatment of Blood Clots
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This Cardiology Patient Page will focus on medical treatment of blood clots that can cause critical illness by blocking the blood supply to the heart, brain, lungs, or legs. Blood clots that develop in the arteries can cause heart attack, stroke, and severe leg pain and difficulty walking. Blood clots in the veins or venous system can cause deep venous thrombosis (DVT) in the pelvic, leg, and upper extremity veins. When these DVTs break off and travel through the bloodstream to the heart and then to the lung blood vessels, they cause acute pulmonary embolism (PE).1

What Medications Will Be Used to Treat My Arterial Blood Clots?

Treatment of arterial clots may include aspirin and clopidogrel (oral antiplatelet agents), intravenous antiplatelet agents, heparin (a blood thinner and anticoagulant), and clot busters (thrombolytic agents). In addition to medications, special interventional catheters may be used to remove or compress these arterial clots.

Antiplatelet Agents
Chewing an adult-strength aspirin tablet (325 mg) at the onset of heart attack symptoms can improve survival by 20%.2 Consequently, healthcare professional personnel administer aspirin to patients who may be experiencing a heart attack, thereby avoiding further injury to the heart muscle before the arrival of emergency medical services.3 The Clopidogrel in Unstable angina to prevent REcurrent events (CURE) Trial showed that clopidogrel, another oral antiplatelet agent, given in conjunction with aspirin, reduces the risk of death even further in the setting of certain types of heart attacks.4 Intravenous antiplatelet agents may also be used to treat impending or evolving heart attacks in combination with aspirin and clopidogrel. This triple antiplatelet therapy is highly potent and predisposes the patient to bruising. However, major bleeding complications, such as stomach ulcer bleeding, are rare.

Anticoagulants
Intravenous (IV) heparin, administered continuously, is the traditional anticoagulant prescribed to prevent growth of a blood clot. Achieving the most effective dose requires frequent blood test measurements with a laboratory clotting test that records the activated partial thromboplastin time (aPTT). To treat heart attack patients, the heparin dose is adjusted to a target aPTT in the range of 50 to 70 seconds.

Low molecular weight heparin (LMWH) constitutes an important advance over traditional heparin. LMWH, administered once or twice daily by injection based on the patient’s weight, ordinarily requires no dose adjustment and little or no blood test monitoring. The two Food and Drug Administration (FDA)-approved agents for treatment of certain types of established or impending heart attack are enoxaparin and dalteparin. Like traditional heparin, they may cause unintended bleeding as a side effect.

Thrombolytic Agents

These clot busters can dissolve arterial clots but cause more serious bleeding problems than antiplatelet agents or anticoagulants. The thrombolytics cannot differentiate a bad clot that is causing a heart attack from a good clot that has sealed over a stomach ulcer or weak brain artery. Consequently, the approximate 20% improvement in heart attack survival is complicated by a brain hemorrhage rate of about 1%.
Additional clots and permit the body
Anticoagulants prevent formation of
the 5% or so of patients unable to
addition to heparin and warfarin. For
may receive thrombolytic agents in
usually requires at least 5 days to
operation with the oral blood thinner warfa-
Venous blood clot currently forms. Venous blood clots from reaching the lungs after
breaking off from the pelvic or deep
leg veins. However, the filter does not halt the blood clotting process.5

LMWH
LMWHs have transformed acute un-
complicated DVT from a disease re-
quiring at least a 5-day hospitalization to
an illness that can usually be man-
aged either on an outpatient basis or
with an overnight hospital stay. The
only FDA regimen specifically ap-
proved for outpatient treatment of
DVT is the LMWH agent enoxaparin
administered as 1 mg per kilogram of
body weight twice daily. The dose is
reduced in the presence of kidney dis-
ease or marked obesity. The blood-
thinning action of LMWH is fully
effective within several hours of ad-
ministration, and patients or family
members learn how to inject it.

IV Heparin
Standard treatment of acute PE re-
quires a continuous IV infusion of
heparin, used in a higher intensity than
for arterial blood clots, with the dose
adjusted to a target aPTT of 60 to 80
seconds. IV heparin is administered
throughout the hospitalization, which
typically averages 5 to 7 days, until the
oral blood thinner, warfarin, has be-
come fully effective. There is an
evolving trend toward using LMWH
rather than IV heparin, especially after
the first day or two of hospitalization,
when clinical improvement has become
apparent. Some low-risk patients with
PE are being discharged after several
days of using LMWH as a bridge to
warfarin.6

Warfarin
Warfarin (also referred to by its brand
name, Coumadin) functions as an oral
anticoagulant by disrupting the body’s
natural vitamin K-clotting system.
Warfarin is the foundation for long-
term treatment of DVT and PE and is
tolerate blood thinners or in whom
blood thinners fail, a permanent metal
filter may be inserted into the inferior
ternal vein, the largest vein below the
heart. The filter prevents large blood
clots from reaching the lungs after
breaking off from the pelvic or deep
leg veins. However, the filter does not halt the blood clotting process.5

What Medications Will Be
Used to Treat My Venous
Blood Clots?
Anticoagulants prevent formation of
additional clots and permit the body’s
natural clot-dissolving activity to nib-
ble away at the DVT or PE that has
already formed. Venous blood clot
treatment requires heparin for its rapid
action as a blood thinner in conjunc-
tion with the oral blood thinner warfa-
rin. Warfarin, administered once daily,
usually requires at least 5 days to
become fully effective.

Patients with a massive DVT or PE
may receive thrombolytic agents in
addition to heparin and warfarin. For
the 5% or so of patients unable to
essential for the prevention of stroke
from atrial fibrillation7 and for preven-
tion of clotting in mechanical heart
values.

Warfarin poses a greater challenge in
safe and effective administration,
requires more patient-healthcare pro-
vider collaboration, and generates
more questions than any other drug that
we prescribe. Patients walk a tightrope: too little warfarin can lead to
catastrophic cloting; too much warfa-
rin can cause life-threatening major
bleeding. Warfarin, like IV heparin but
unlike most other drugs, cannot be
prescribed in a fixed or weight-
adjusted dose. Instead, the dose must
be adjusted according to a laboratory
blood test that measures the length of
time it takes for clotting to begin, or
prothrombin time (PT). The test is
standardized to account for different
laboratory processes and is called the
International Normalized Ratio (INR).
The INR of a healthy individual not
taking warfarin is 1.0. The INR in-
creases with increasing intensity of
anticoagulation. For patients with
DVT or PE, the usual target INR is 2.0
to 3.0. For the occasional patient re-
quiring even more intensive anticoag-
ulation, the target INR may be raised
to levels as high as 4.0.

When warfarin is used, there are
multiple drug-drug and drug-food in-
teractions that affect the INR. Regular
monitoring of the INR is therefore
essential to provide optimal dosing.
The INR is usually obtained several
times weekly at the initiation of treat-
ment with warfarin. Once a stable INR
and warfarin dose are achieved, the
INR frequency is gradually decreased
to once monthly. More frequent mon-
toring is essential when other medica-
tions are started or discontinued, in-
cluding over-the-counter medications,
vitamins, and nontraditional natural
herbs, minerals, or plants. For exam-
ple, the commonly prescribed antiar-
rhythmic drug amiodarone and many
antibiotics markedly increase the anti-
cogulant effect of warfarin, causing
an excessive rise in the INR. Sudden
binges or abstinence from vitamin

Tips on Self-Injection of Low Molecular Weight Heparin

- Select a site where you can “pinch an inch” of fat, usually the abdomen, thigh, or hip. Stay at least 3 fingerbreadths away from the belly button.
- Cleanse the injection site gently with an alcohol swab prior to injection, but do not rub or swab the site after injection.
- Inject with a rapid, purposeful movement. If using a prefilled syringe of enoxaparin, do not expel the air bubble prior to injection.
- Dispose of the needle and syringe in a box especially designed for this purpose (a sharps box). Bring the filled sharps box to your health care provider for proper disposal, or follow carefully your town or city’s regulations for proper disposal.

What Medications Will Be Used to Treat My Venous Blood Clots?
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K-containing foods such as spinach, broccoli, and brussel sprouts will affect the INR. The combination of alcohol and warfarin will increase the likelihood of bleeding, even in situations when the INR does not rise markedly. Sometimes, important fluctuations can occur in the INR without an identifiable reason.

What Are the Alternatives to Warfarin?
Alternative strategies are very limited. For now, they include self-injected LMWH once or twice daily and self-injected traditional heparin twice or three times daily. In the future, other agents will become available and provide immediate anticoagulation with much less frequent blood test monitoring.

References
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