When to Use—and How

thrombotic disease and arterial thrombotic disease, because the pathogenesis of the two may be quite dissimilar. This is a critical distinction therapeutically because they require different modes of treatment and prevention.

Clotting Leads to Bleeding

There is, in addition, a relatively recent concept suggesting a third, basic type of coagulopathy, which is neither classical arterial disease nor venous disease, but one that affects primarily the large vessels, small vessels, and capillaries. It is diffuse, intravascular coagulation, which is a complication attendant to many acute, subacute, and chronic diseases that lead to either overt thrombosis and/or what we call paradoxical hemorrhage in the face of thrombosis. Whatever triggers the coagulation uses up clotting factors in the blood, and bleeding results from the "consumption" of those factors, hence the term, consumption coagulopathy. Thus, paradoxically, a primary clotting problem leads to a bleeding problem.

Now as far as we know there are three elements that keep that body from bleeding, or blood from clotting. One is the integrity of the blood vessels, and this has been much underrated in the past. Very little has been written, until the last decade, about the role of the vessel itself in preventing either hemorrhage or thrombosis.

The second element is the function of the platelet, a process that is being given more and more attention. If the blood vessel is the first line of defense against coagulopathy, then the platelet is the second line. Platelets course through the blood, and when a vessel is injured they leave the mainstream and, through a series of complicated physical, biochemical, and structural changes, form the primary hemostatic plug, which blocks the hole in the vessel.

The third element in the control of hemorrhaging and clotting is a group of various coagulation factors. For example, in order to maintain large blood vessel integrity during a surgical procedure, it is very important to the clotting process that an entire chain of plasmatic factors are present, and that there is a working system of the checks and balances that aid or inhibit coagulation.

Roles of Heparin and Warfarin

For some time we have been aware that hemorrhage is caused by lack of platelets or clotting factors, or by abnormalities in blood vessels. We have not been so aware of how these same elements may be leading to clotting, even in the best-known type of thrombosis—that is, thrombophlebitis. It has been thought that this is a classical disorder in which the blood-clotting factors are in some way activated and the clots formed, and that the only way to treat the acute condition is with heparin. For long-term prevention, warfarin derivatives were the choice.

We are now finding that there are people who have recurrent phlebitis or recurrent venous disease that may be resistant to those agents. We are beginning to