BRIEF REVIEW

Preoperative Hemostatic Evaluation: Which Tests, if Any?

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When the whole blood clotting time and the Duke bleeding time were the tests used to screen hemostatic function preoperatively, the question posed in the title of this brief review was easy to answer: Do not bother with these insensitive tests, rely on the patient's history. However, the reliability today of screening techniques that can detect virtually all patients with hemostatic abnormalities has changed the answer and rendered it more complex.

One may logically ask: If the history alone was good enough before, why not now? There are four reasons for advocating tests in addition to the history. First, they may protect against the doctor who fails to take an adequate history. In my city, a patient who was defibrinating from metastatic prostatic carcinoma bled to the point of requiring transfusions after an elective biopsy of the ear performed by a doctor concerned only with the patient's minor skin problem. Second, some patients give an unreliable history, e.g., the patient with a mild bleeding disorder who does not realize that the bleeding he or she has experienced after trauma or surgery is excessive. Third, a patient may have an abnormality, such as factor XI deficiency, that causes bleeding only after surgery and may not yet have had surgery or dental extractions. Finally, a patient who has withstood surgery without abnormal bleeding may later acquire a hemostatic defect, such as thrombocytopenia, that has remained asymptomatic.

Screening tests, therefore, have a role in preoperative evaluation, a role determined by a general evaluation of the patient's clinical status, by the information obtained from a screening bleeding history, and by the type of surgery planned. Consequently, it is important that doctors and their institutions develop a standardized procedure for taking a screening history on all preoperative patients.

A simple screening questionnaire, which most patients should be able to complete while waiting to be seen, can be designed from the following questions:

1. Have you ever bled for a long time or developed a swollen tongue or mouth after cutting or biting your tongue, cheek, or lip?
2. Do you develop bruises larger than a silver dollar without being able to remember when or how you injured yourself? If so, how big was the largest of these bruises?
3. How many times have you had teeth pulled and what was the longest time that you bled after an extraction? Has bleeding ever started up again the day after an extraction?
4. What operations have you had, including minor surgery such as skin biopsies? Was bleeding after surgery ever hard to stop? Have you ever developed unusual bruising in the skin around an area of surgery or injury?
5. Have you had a medical problem within the past 5 yr requiring a doctor's care? If so, what was its nature?
6. What medications, including aspirin or any other remedies for headaches, colds, menstrual cramps, or other pains, have you taken within the past 7–9 days?
7. Has any blood relative had a problem with unusual bruising or bleeding after surgery? Were blood transfusions required to control this bleeding?

From briefly reviewing the answers to these questions with the patient, a physician should be able to reach one of the following conclusions: (1) that the screening history contains sufficient information to conclude that hemostatic function is normal; (2) that, although negative, the screening history does not contain sufficient tests of hemostasis to assure that the hemostatic mechanism will function normally after surgery; or (3) that the screening history raises either the possibility or the likelihood of a defect in hemostasis.

This knowledge and the knowledge of the surgery planned can be used to establish four levels of increasing concern that determine the extent of the preoperative laboratory testing. Although decisions in borderline cases will vary with an individual physician's temperament, practice environment, and knowledge gained from past experience, one can propose the following broad guidelines.

Level I

The screening history is negative, although it may or may not contain prior surgical tests of hemostasis; the
surgery is minor, e.g., uncomplicated dental extraction, excisional biopsy. No screening tests are recommended. One accepts that the cumulative cost to society of screening tests before minor surgery for all patients outweighs the inevitability of unforeseen nuisance (but not life-threatening) bleeding in an uncommon patient with a mild bleeding disorder not detected from the history.

**Level II**

The screening history is negative and contains prior surgical tests of hemostasis; the surgery is major, e.g., cholecystectomy or bowel resection, but not in the highest risk group of procedures. *A partial thromboplastin time (PTT), performed with sensitive reagent,* and a platelet count are recommended. These screening tests should eliminate the risk of the life-threatening bleeding that could result from performing major surgery in a patient with an unsuspected acquired anticoagulant or severe thrombocytopenia. The screening tests should also detect occult disseminated intravascular coagulation (moderate thrombocytopenia, short or long PTT). One accepts not screening for recently acquired qualitative platelet defects with a bleeding time test, relying instead on the absence, on general clinical evaluation of the patient, of evidence of one of the underlying disorders in which such qualitative platelet defects develop, e.g., uremia, a myeloproliferative disorder, or a monoclonal gammopathy.

**Level III**

This category includes all patients whose screening bleeding history raises a possibility of defective hemostasis. It also includes a group of patients who, regardless of their screening bleeding history (but not in place of it), deserve a full screening work-up. This latter group includes patients in whom the procedure may impair hemostasis, e.g., the patient undergoing cardiac surgery in which a pump-oxygenator may damage the platelets; patients undergoing prostatectomy, a procedure in which hemostasis must be maintained on raw surfaces bathed in urokinase; and patients undergoing surgical procedures in which even minimal postoperative bleeding could be hazardous, e.g., patients undergoing surgery of the central nervous system.

The full work-up of patients in level III should include screening tests for the following. (1) The adequacy of formation of hemostatic plugs: the platelet count plus a bleeding time by a technique that utilizes a cuff on the arm inflated to 40 mm Hg and a disposable springloaded bleeding time devise (Simplate II). (2) The adequacy of the blood coagulation reactions: the PTT and the one-stage prothrombin time by the Quick method, i.e., the thromboplastin time. (3) The size and stability of the fibrin clot. Aliquots of 0.2 ml plasma are clotted with 0.1 ml of CaCl₂ and the clots are incubated overnight in 3 ml of saline to screen for abnormal fibrinolysis, and in 3 ml of 5 M urea to screen for factor XIII deficiency. If the results are negative, one concludes that the screening history is not abnormal enough to warrant further testing in the face of this normal screening evaluation.

**Level IV**

The screening bleeding history leaves one very suspicious or certain of a hemostatic abnormality; the surgery may be major or minor. The initial screening work-up for these patients is the same as for patients in level III. However, if this evaluation is negative, then the following additional tests are performed.

(1) The patient is given 600 mg of aspirin and the bleeding time is repeated. This will uncover a substantial number of patients with von Willebrand's disease or with a mild qualitative platelet disorder. If the surgery is urgent, one cannot do an aspirin bleeding time, for it takes several days for a prolonged bleeding time induced by aspirin to return to normal. Rather, one should move directly to platelet aggregation tests, utilizing adenosine diphosphate (ADP), collagen, epinephrine, and arachidonic acid and to a Ristocetin cofactor assay.

(2) Specific factor VIII and factor IX coagulant activity are measured. Particularly when other coagulation factor levels are elevated, a rare patient with mild hemophilia may have a PTT value within a laboratory's normal range despite a factor VII or factor IX level of 20%-40% or normal.

(3) A thrombin time is performed, utilizing a thrombin concentration that gives a time of 15–20 sec with normal plasma. This may uncover unusual patients with a dysfibrinogenemia or a weak heparin-like anticoagulant that fails to lengthen the prothrombin time or PTT significantly.

If these additional tests are all normal and the history, on reevaluation, still remains convincing for abnormal bleeding, then one should measure the level of plasma alpha₂-antiplasmin activity quantitatively. A partial deficiency of this inhibitor, e.g., 40% of normal activity, will not be detected in a screening test for fibrinolysis; yet, in one patient the author saw, a partial deficiency of this degree was associated with profound fibrinolytic bleeding during open heart surgery.

The further investigation of patients with positive screening results obviously depends on both the history and the pattern of the laboratory findings. However, one problem that arises from following the above recommendations for preoperative laboratory testing...
deserves additional comment. A small, but not insignificant, number of patients will be discovered with a completely negative bleeding history and a long PTT. Although the long PTT will usually stem from an abnormality that does not cause clinical bleeding, one must delay surgery until this is established. The vast majority of patients will fall into one of two groups: patients with a reduced level of one of the contact activation factors or patients with the lupus anticoagulant. Finding that factor XII, prekallikrein, or high molecular weight kininogen is the reduced factor eliminates further concern. However, when factor XI is the reduced factor and the patient has not bled after earlier surgery, uncertainty arises. If the contemplated surgery imposes a severe hemostatic challenge, e.g., prostatectomy, then replacement therapy should be given.5

If a long PTT results from the lupus anticoagulant, then the patient will also not bleed normally, provided that associated prothrombin deficiency, thrombocytopenia, or a severe qualitative platelet abnormality have been ruled out.6 Thus, in a patient with the lupus anticoagulant, one must make sure that the prothrombin time is normal or nearly normal and that the platelet count and the bleeding time are normal. Paradoxically, the discovery of the lupus anticoagulant now arouses more concern about an increased risk of thrombosis7 than of bleeding. If major surgery is contemplated, one must seriously consider administering prophylactic low-dose heparin.

Finally, if the above recommendations are followed, one will also identify substantial numbers of preoperative patients with a short PTT.4,8,9 This test result must not be dismissed lightly, for such patients also have an increased risk of postoperative thromboembolism.8,9 Patients with a short PTT represent a second group of surgical patients in whom one may wish to consider the use of prophylactic low-dose heparin.

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