CME CREDIT

The preoperative bleeding time test: assessing its clinical usefulness

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SUMMARY The bleeding time test can aid in the diagnostic evaluation of patients with clinical hemorrhagic disorders or a history of bleeding. However, its low positive predictive value in predicting perioperative bleeding should force one to abandon it as a routine preoperative screening test.

KEY POINTS Many methodologic factors affect the bleeding time, including the length, depth, orientation, and location of the incision and whether a blood pressure cuff is used. The bleeding time also varies with age, sex, blood group, medication use, skin characteristics, and diet. A prolonged bleeding time itself is nonspecific and is not pathognomonic of a single disease entity. Many studies have shown no association between a prolonged preoperative bleeding time and increased perioperative blood loss. Even though a prolonged preoperative bleeding time usually lacks clinical significance, it often leads to additional laboratory tests, postponement of surgery, increased length of stay, and possibly inappropriate treatment.

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THE BLEEDING TIME is the most commonly used test in the in vivo evaluation of primary hemostasis. Although this test is known for its role in the evaluation of patients suspected of having von Willebrand's disease or abnormal platelet function, it is quite often routinely ordered as part of preoperative screening to predict perioperative bleeding in patients with no previous clinical signs of a bleeding disorder. Physicians should be familiar with factors that affect the standardization, reliability and specificity of the bleeding time test, as well as the pitfalls of using it to predict clinically significant perioperative bleeding.

THE EVOLUTION OF THE BLEEDING TIME TEST

The bleeding time test was first described by Milian in 1901.[1] In 1910, Duke[2] introduced its use as an in vivo measurement of the adequacy of platelet plug formation, using the earlobe as the test site. Since then, several modifications and variations have been introduced, mostly in an attempt to standardize the bleeding time and

increase its reliability. In 1941, Ivy et al[3] suggested the forearm be used as the site of testing and that a blood pressure cuff be applied and inflated to 40 mm Hg to standardize venous return to the area. In 1969, Mielke et al[4] improved upon Ivy's technique by using a template to help standardize the length and depth of the incision. In a complete departure from the other methods, Ratnoff[5] devised a technique that used the finger tip as the site of testing. Today, most institutions use a modified Ivy technique and commercially manufactured, disposable template devices with spring-loaded blades that make an incision of uniform length and depth.

MULTIPLE FACTORS AFFECT THE BLEEDING TIME

Despite these improvements and modifications, the bleeding time test continues to be prone to many technical problems that interfere with its standardization and reliability. Many factors affect the reproducibility of the bleeding time. Test results are highly operator-dependent, with significant interoperator variability.[6] This reflects the technical difficulties inherent in the test methodology: the length, depth, orientation (vertical vs horizontal), and location (volar aspect of the forearm vs antecubital fossa) of the incision can all affect the results, as can the use of a blood pressure cuff and the characteristics of the skin (thickness, degree of underlying vascularity, and density of hair).[7,8] Although the introduction of a spring-loaded device has standardized the length and depth of the incision to some extent, the other variables remain, making it difficult to derive a valid and clinically useful bleeding time.

The bleeding time also varies with age, sex, blood group, medication use, and diet.[9–13] These factors probably account for the wide variation in the bleeding time in the normal population. The bleeding time is shorter in older people and in males and longer in people with type O blood. Ingestion of aspirin commonly causes prolongation of the bleeding time. Many other classes of medications also interfere with platelet function; most commonly implicated are nonsteroidal anti-inflammatory drugs, antibiotics, anticonvulsants, cardiovascular drugs, and ethanol.[14,15] Several vitamins and spices have been reported to cause platelet dysfunction in vitro, including vitamins C and E, garlic, ginger, cumin, and cloves.[16–21] Although these do not usually cause a problem when consumed in moderation, concentrates can be obtained from "nutrition centers," and megadoses of these substances may prolong the bleeding time.[22]

THE NONSPECIFICITY OF A PROLONGED BLEEDING TIME

A prolonged bleeding time in and of itself is nonspecific and not pathognomonic of a single disease entity. In fact, it can be associated with either a quantitative or qualitative abnormality of any element involved in primary hemostasis: platelets, the vessel wall, collagen, or von Willebrand's factor. The clinical conditions associated with an abnormal bleeding time include quantitative and qualitative platelet disorders, anemia, vasculitis, uremia, hepatic dysfunction, von Willebrand's disease, Ehlers-Danlos syndrome, severe hypofibrinogenemia, myeloproliferative disorders, and paraproteinemias.

THE BLEEDING TIME AS A PREOPERATIVE SCREENING TEST

Approximately half of the 1 to 2 million bleeding time tests performed each year are ordered as part of a preoperative evaluation to assess perioperative bleeding risk.[23] The clinical use of the bleeding time in this fashion implies the acceptance of at least two assumptions. The first is that superficial bleeding of the skin accurately reflects the potential for bleeding at other sites. However, O'Laughlin et al[24] evaluated the effect of short-term and long-term aspirin use in patients undergoing gastric biopsy and found no evidence that an increased skin bleeding time reflected an increased gastric bleeding time.

The second assumption is that prolongation of the bleeding time is clinically significant. Many studies and reviews that examined this question have demonstrated that the predictive value of the preoperative bleeding time is poor.[25–27] Unfortunately, many of these studies had limited usefulness: they lacked a control group, did not use objective criteria to define or measure intraoperative or postoperative bleeding, or did not correlate bleeding time with other important indicators of platelet function.

More recently, Gewirtz et al[28] examined the predictive value of the preoperative bleeding time and how it was used clinically in multiple surgical services. Although patients with a history of bleeding were more likely to have an abnormal bleeding

time, there was no statistically significant association between an abnormal bleeding time and perioperative bleeding or use of blood products. The positive predictive value of the routine preoperative bleeding time for predicting perioperative bleeding was only 5%.[28]

The association between platelet dysfunction and perioperative blood loss has been investigated in a variety of surgical settings. Owing to the use of cardiopulmonary bypass, cardiovascular procedures have a deleterious effect on platelets, and perioperative bleeding has been extensively investigated in this patient population. Simon et al[29] found that "...thrombocytopenia and prolongation of bleeding time did not correlate with blood loss or transfusion needs." Burns et al[30] concluded that there was no correlation between the bleeding time and either the decrease in hemoglobin concentration or the amount of chest-tube drainage after surgery. Their findings have been supported by many others in both prospective and retrospective studies.[31–33]

The most extensive study in noncardiac surgery was a retrospective one by Barber et al.[34] Of 1941 patients, 110 (5.7%) had abnormal preoperative bleeding times. Of these patients, 58 subsequently underwent surgery, and only six (10.3%) lost more than 500 mL of blood.[34] Other studies involving general surgery, emergency surgery, tonsillectomy, middle ear surgery, and cataract surgery support the conclusion that a prolonged bleeding time does not correlate with clinically significant perioperative bleeding.[35–39]

Not infrequently, surgical patients have been taking medications that can impair platelet function. The possibility of perioperative bleeding in such patients is often of clinical concern and often leads to the ordering of a bleeding time test. However, in a study of patients who were given aspirin before undergoing total hip replacement, Amrein[40] found that the bleeding time was prolonged, but perioperative bleeding was not increased. In another study, Ferraris and Swanson[36] found that only eight of 22 patients who had taken aspirin within 72 hours of an unplanned surgical procedure had prolonged bleeding times, but neither a prolonged bleeding time nor aspirin ingestion was associated with increased perioperative bleeding. For patients undergoing cardiopulmonary bypass, administration of aspirin within 12 hours of CABG was not associated with increased postoperative bleeding, but bleeding time data were not obtained.[41] Gewirtz et al[28] found no statistically significant correlation between ingestion of medications known to interfere with platelet function and prolonged bleeding time or significant perioperative bleeding.

IS THERE A CLINICAL ROLE FOR THE PREOPERATIVE BLEEDING TIME TEST?

Before surgery, patients with a clinical history of excessive bleeding may deserve a hematologic evaluation that includes a bleeding time test. However, many investigators in various disciplines have demonstrated that routine preoperative testing of the bleeding time lacks predictive value in assessing the risk of perioperative bleeding.

An abnormal bleeding time presents the laboratory, clinician, and hospital with many problematic issues, all of which contribute to increased utilization of resources and higher health care costs. The far-reaching effects of an abnormal result can, depending on the situation, include the ordering of additional laboratory tests, postponement of surgery, increased length of stay, and, possibly, inappropriate treatment with blood products and drugs (in particular desmopressin acetate) in an attempt to normalize the bleeding time. In addition to these added costs, each of the 500 000 to 1 million preoperative bleeding time tests performed each year costs approximately $30, resulting in an annual cost of $15 to $30 million.

CONCLUSION

Given the low positive predictive value of the preoperative bleeding time and the need to reduce health care spending where possible, the bulk of the evidence demands that the bleeding time be abandoned as a preoperative screening test.

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