

room temperature. The tubes do not come in contact with water or ice, affording a more convenient method of refrigerating plasma than the conventional cup or tray of crushed ice.

BLEEDING TIME

The bleeding time is a measure of hemostasis and coagulation. It is dependent upon the efficiency of tissue fluid in accelerating the coagulation process, on capillary function, and on platelets. It is especially concerned with platelets: the number of blood platelets present and their ability to form a platelet plug. Prolonged bleeding times are generally found when the platelet count is below 50,000 per cu mm, and where there is platelet dysfunction such as in von Willebrand's disease. Three procedures are currently in use for determining the bleeding time: the Duke method, the Ivy method, and the Mielke method. The Duke method is the easiest to perform but probably yields the least accurate results. The procedure of choice is the Mielke method.

Duke Method

REFERENCES

Biggs, R., and MacFarlane, R.G.: *Human Blood Coagulation and its Disorders*, Blackwell Scientific Publications, Oxford, 1962.

Duke, W.W.: The pathogenesis of purpura haemorrhagica with especial reference to the part played by the blood platelets, *Arch. Intern. Med.*, 10, 445, 1912.

REAGENTS AND EQUIPMENT

1. Sterile, disposable lancet.
2. Circular filter paper.
3. Stopwatch.
4. Alcohol sponges.

PRINCIPLE

A standardized puncture of the ear lobe is made, and the length of time required for bleeding to cease is recorded.

PROCEDURE

1. Cleanse the ear lobe with an alcohol sponge and allow to dry.
2. Make a relatively deep puncture with the sterile blood lancet and start the stopwatch.
3. Using the circular filter paper, blot the blood every 30 seconds. Do not allow the filter paper to touch the wound.
4. When bleeding ceases, stop the watch and record the bleeding time. The normal bleeding time is 1 to 3 minutes, borderline, 3 to 6 minutes.

DISCUSSION

1. If bleeding continues for more than 10 minutes, discontinue the test and apply pressure to the wound. It is advisable to repeat the procedure or to perform another bleeding time, according to Ivy's method.
2. An alternative procedure requires the holding of a glass slide behind the ear lobe for support. Make a puncture with the sterile blood lancet. Start the stopwatch, discard the glass slide, and proceed with the test as previously described.

Ivy Method

REFERENCES

Dacie, J.V., and Lewis, S.M.: *Practical Hematology*, 5th Edition, Churchill Livingstone, New York, 1975.

Ivy, A.C., Nelson, D., and Beecher, G.: The standardization of certain factors in the cutaneous "venostasis" bleeding time technique, *J. Lab. Clin. Med.*, 26, 1812, 1940.

REAGENTS AND EQUIPMENT

1. Blood pressure cuff.
2. Sterile, disposable blood lancet, capable of a wound 1 mm wide and 3 mm deep.
3. Stopwatch.

4. Circular filter paper.
5. Alcohol sponges.

PRINCIPLE

Two standardized punctures of the forearm are made, and the length of time required for bleeding to cease is recorded.

PROCEDURE

1. Place a blood pressure cuff on the patient's arm, above the elbow. Increase the pressure to 40 mm of mercury and hold this exact pressure for the entire procedure.
2. Cleanse an area on the volar surface of the forearm with an alcohol sponge and allow to dry.
3. Choose an area approximately three finger widths below the bend in the elbow. Hold the skin tightly by grasping the underside of the arm firmly. Make two skin punctures, 3 mm deep, avoiding any subcutaneous veins. Start the stopwatch.
4. Blot the blood from each puncture site on a separate piece of circular filter paper every 30 seconds. The filter paper should not touch the wound at any time.
5. When bleeding ceases, stop the watch and release the blood pressure cuff.
6. Record the bleeding times of the two puncture sites and report the average of the two results. The normal bleeding time is 1 to 7 minutes, with bleeding times of 7 to 11 minutes considered borderline.

DISCUSSION

1. If bleeding continues for more than 15 minutes, the procedure should be discontinued, and pressure applied to the wound sites. The bleeding time should be repeated on the other arm. If bleeding has again not ceased within 15 minutes, the results are reported as greater than 15 minutes.
2. The greatest source of variation in

this test is largely due to difficulty in performing a standardized puncture. This usually leads to erroneously low results. On the other hand, if a small vein is punctured, the bleeding time will be prolonged. Therefore, if the bleeding time is less than 1 minute or greater than 7 minutes, the procedure should be repeated using the other arm.

Mielke Method

A modification of the Ivy bleeding time has been described by Mielke and associates (Mielke, C.H., Kaneshiro, I.A., Maher, J.M., Weiner, J.M., and Rapaport, S.I.: The standardized normal Ivy bleeding time and its prolongation by aspirin, *Blood*, 34, 204, 1969). In this procedure, a Bard-Parker or similar disposable blade is employed, along with a rectangular polystyrene or plastic template that contains a standardized slit. The blade is placed in a special handle containing a gauge in order to standardize the depth of the incision. The slit in the template will standardize the length of the incision. The same procedure as described for the Ivy bleeding time is employed, utilizing the blood pressure cuff. Two incisions 9 mm long and 1 mm deep are made. The average of the two bleeding times is reported. Normal values for this procedure are 2.5 to 10 minutes. It should be noted, however, that small scars may be caused by this method.

Simplate Method

The bleeding time, utilizing the Simplate bleeding time device (manufactured by General Diagnostics, Division of Warner-Lambert Company), is a modification of the Ivy procedure and gives results similar to those obtained in the Mielke test. The Simplate contains a spring-loaded blade within a white plastic case. When the tear-away tab (Fig. 127) is removed, the trigger may be depressed and the edge of the blade (5 mm in length) will spring 1 mm forward out from the housing. The