LETTERS TO THE EDITOR

Radiometry of Blood Loss during Operation

Blood lost during surgical procedures is removed by two main methods—(a) by mopping with towels, sponges, etc. and (b) by suction. The blood soaking towels and sponges can be fairly accurately measured by the gravimetric method —i.e., weighing the towels before and after the operation. The specific gravity of the blood being 1.054, 1 ml of blood increases the weight of the towel by 1 g, for practical purposes. Blood aspirated from the surgical site can be collected and measured, provided the water in the suction bottle has been measured beforehand. This method, however, interferes with the routine operative procedure, since the towels and sponges should be used dry and the suction nozzle must be dipped into a known volume of water. The radioactive method described below avoids these problems. It involves six steps.

1. About 1 hr before the operation, inject about 2 mCi of $^{113m}InCl_3$ at pH 3.
2. Withdraw three samples of blood, 6 cc each—one just before the operation, a second at the middle, and the third at the end of the operation. These are used to prepare two standards, one for the external probe and one for a well counter. Five cc from each sample are spilled over a dry sponge and used as a linen standard. Three cc of blood (1 cc from each sample) are diluted suitably and used as a suction-fluid standard.
3. All the sponges, towels, and aprons used in the operation are collected and immediately brought to the nuclear medicine department. There they are counted individually with a thyroid probe at a convenient distance (18 cm).
4. All the fluid in suction bottles and basins is collected, mixed well, and measured. A 4-cc aliquot is counted in a well counter.
5. The linen standard and liquid standard are counted and corrections applied for decay.
6. If x is the total count from all the blood-soaked linen, and y is the count from the linen standard soaked with 15 cc of blood, $x \times 15/y$ is the amount of blood (cc) lost to the linen. Similarly, if a is the count per minute of the suction-fluid aliquot, b is the count per minute from the standard blood diluted by a factor of D, and V the volume of the fluid in suction bottle and basins, then the volume of blood in suction fluid and basin is $V \times D \times 3a/4b$ ml.

The theoretical basis of this relationship depends on in vivo labeling of plasma by ionic indium. If ionic indium is injected intravenously, it becomes bound to plasma transferrin immediately (*1,2*) and is cleared from the blood with a biologic half-life of 10 hr. Wootton (*3*) and Wochner (*4*) have used indium transferrin to estimate blood volume and have stated that their results are 5–14% higher than the value given by the I-131 HSA method.

However the level of indium shows only a slight, gradual fall after injection: 7% in 1 hr and 13% in 2 hr (almost linear). Less than 1% is bound to RBCs (*4*), and renal excretion is less than 0.5% in 24 hr (*5*). Over the next few days it is cleared from the blood to accumulate in the liver, spleen, and bone marrow.

We have tried this method in about 20 cases and have compared it with the clinical assessment of blood loss and the loss reported by other workers by the gravimetric method. It was found to be reasonably accurate.

The purpose of this letter is to inquire about the theoretical validity of the method used and also to find out whether any other tracer with a somewhat longer life (say, 12 hr) is available for in vivo labeling.

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Gastric Distention Simulating a Left Subphrenic Abscess

A right subphrenic abscess may be detected on a radionuclide RES-lung study by a separation of pulmonary and hepatic activity, since the liver lies close to the diaphragm and thus to the lung. The spleen does not lie in as close proximity to the left diaphragm and lung as does the liver. For this reason the diagnosis of a left subphrenic abscess on an RES-lung study must be made with less certainty. In a study of 50 patients without proven left subphrenic abscess, DeLuca and Kolodny (*1*) noted that the spleen and lung were always contiguous in at least one view on an RES-lung study. They recommended that a left subphrenic abscess should be considered if the splenic and pulmonary activity were separated on all views, unless some intrathoracic processes could explain the space between the two organs. On the basis of these criteria, a possibly incorrect diagnosis of a subphrenic abscess on the left could be made.

A 22-year-old man who had undergone a Billroth II hemigastrectomy for peptic ulcer 3 wk previously, was admitted because of 48 hr of unremitting left shoulder pain. On admission he was afebrile, and found to have dilation of his gastric remnant on radiographic studies. Nasogastric suction was started for what at first was thought to be gastric