A Potential Error in the Quantitation of Fecal Blood Loss: Concise Communication

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Chromium-51-labeled red cells were used to quantitate fecal blood loss in a patient with chronic upper gastrointestinal hemorrhage. On Day 1, the stool guaiac was positive but the blood loss indicated by ^{51}Cr was less than 1 cm^3. Blood loss in the stool by ^{51}Cr did not become significant until Day 3, when it measured 23 cm^3. The failure to detect abnormal blood loss on Day 1, and probably on Day 2, appears to be due to a long intestinal transit time from a proximal bleeding site. The problem of slow intestinal transit is not uncommon and could lead to a false-negative study or falsely low estimates of fecal blood loss. This problem could be minimized by beginning stool collection on Day 3 or by delaying stool collection until the appearance in the stool of an oral nonabsorbable marker swallowed when the ^{51}Cr-tagged red cells are injected.

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Quantification of fecal blood loss by the injection of ^{51}Cr-tagged red cells is a well-recognized nuclear medicine procedure (*1–8*). The method, as described in the nuclear medicine literature, involves a 3–4-day stool collection beginning either immediately after the injection of the ^{51}Cr-labeled red cells or on the following day (Table 1). This procedure, however, may underestimate the blood loss, particularly in patients with upper gastrointestinal hemorrhage and a long transit time. We recently evaluated

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TABLE 1. SUMMARY OF LITERATURE ON QUANTITATION OF FECAL BLOOD LOSS

Source	Time lag from ^{51}Cr injection to stool collection (hr)	Duration of stool collection (hr)	Separate daily containers or pooled	Upper limits of normal for GI blood loss (cm^3/day)
Technology and Interpretation of Nuclear Medicine Procedures (1)	0	72	Separate	1
Textbook of Nuclear Medicine Technology (2)	0	72	Separate	3
Handbook for Technologists of Nuclear Medicine (3)	0	72	Separate	2–5
Principles of Radioisotope Methodology (4)	0	72	Separate	2
Nuclear Medicine (5)	24	72	Pooled	2.8
Principles of Nuclear Medicine (6)	0	96	Separate	—
Diagnostic Nuclear Medicine (7)	24–120	72 (or 3 collections of 24 hr on alternate days)	Separate	1 1–3 suspicious 3 abnormal
Clinical Nuclear Medicine (8)	0	96	—	2

a patient with this condition for gastrointestinal blood loss, using ^{51}Cr-tagged red cells.

A 76-year-old white woman had a 2-year history of iron deficiency anemia and numerous positive stool guaiacs. She was referred for quantitation of fecal blood loss. Her site of gastrointestinal bleeding was unknown despite an upper gastrointestinal series, barium enema, visceral angiography, colonoscopy, and the need for 11 units of blood replacement in the preceding 2 years.

The patient received an injection of 100 μCi of autologous ^{51}Cr-labeled red cells. Stool collections, begun immediately, were obtained on Days 1, 2, and 3, and were followed by a combined collection for Days 6 and 7. The stool was homogenized and counted using both a gamma well counter and a scintillation camera with the window centered on the 0.32-MeV photopeak of ^{51}Cr. The indicated fecal blood loss was less than 1 cm^3 on Days 1 and 2, on Day 3 it was 23 cm^3, and the combined loss for Days 6 and 7 was 16 cm^3.

Although the stool blood loss on Day 1 appeared to be below 1 cm^3, the stool guaiac performed on that day was positive (stool guaiacs were not obtained on Days 2 and 3). The stool guaiac does not become positive in an upper gastrointestinal hemorrhage until the bleeding has exceeded 25 cm^3 (*9*). This fact strongly suggests that the ^{51}Cr study significantly underestimated blood loss on Day 1 and probably on Day 2. The most likely explanation for the failure to detect the abnormal blood loss on Days 1 and 2 was a proximal bleeding site with slow intestinal transit. The ^{51}Cr-tagged red cells entering the gut lumen on Day 1 failed to reach the stool until Day 3. The red cells that caused the positive stool guaiac on Day 1 had presumably entered the gut prior to the injection of the tagged red cells and therefore were not detected by the radionuclide technique. This interpretation was subsequently supported when endoscopy revealed blood in the duodenum.

Slow intestinal transit is not an isolated or rare phenomenon. In another study (*9*), 11 normal subjects ingested 15 cm^3 of packed red cells (equivalent to approximately 30 cm^3 of whole blood) daily for 6 days. Stools were examined each day for occult blood using both the benzidine and guaiac tests. During the first 3 days, all stools from four of the 11 subjects were negative for occult blood by both tests; by the fifth day, stools from all subjects had become positive by at least one of the two tests. Thus, slow intestinal transit occurred in 36% of these normal subjects.

In view of this study (*9*) and the case we have presented, it appears that a false-negative study or a falsely low estimate of blood loss may well occur if stool collection is begun too early. To minimize this potential error, stool collections should begin 48 hr after the injection of labeled red cells. Alternatively, an oral marker such as charcoal or carmine (*10*) could be swallowed by the patient at the same time the ^{51}Cr-labeled cells are injected. When the marker appears in the stool, intestinal transit has occurred and stool collections can begin. This modification of the procedure should allow a more accurate evaluation of intestinal blood loss and result in fewer false-negative studies.

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