Radionuclide Detection and Localization of the Site of Gastrointestinal Bleeding

TO THE EDITOR: In the recent study by Thorne et al. (*1*), they stated in the Introduction of their report "There are two competing radionuclide techniques; one uses a radiopharmaceutical with rapid blood clearance, [^{99m}Tc]sulfur colloid, the other uses a blood-pool agent, ^{99m}Tc-labeled red blood cells (RBCs). Which of these is the better method to use is controversial." The quoted statement is not completely correct because there are published reports in the literature indicating the use of another radiopharmaceutical, technetium-99m diethylenetriaminepentaacetic acid ([^{99m}Tc]DTPA), for detection and localization of the site of gastrointestinal bleeding in both upper and lower abdomen (*2–4*). The use of [^{99m}Tc]DTPA for this purpose has also been presented at several international scientific meetings including SNM (*5*), RSNA (*6*), European Congress of Nuclear Medicine (*7,8*), and World Federation of Nuclear Medicine and Biology (*9*).

The authors apparently failed to recognize and mention the use of [^{99m}Tc]DTPA for detection and localization of GI bleeding site. In our opinion, [^{99m}Tc]DTPA is the most effective radiopharmaceutical for detecting and localizing GI bleeding sites in both upper and lower abdomen. Both [^{99m}Tc]RBCs and sulfur colloid are effective in detecting and localizing GI bleeding sites only in the lower abdomen.

References

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REPLY: We thank Dr. Owunwanne and colleagues for their interest in our work (*1*). The purpose of our study was to determine the minimal bleeding rate that could be detected using technetium-99m-(^{99m}Tc) labeled red blood cells in an experimental GI bleeding model and to compare that with the other major label for detecting GI bleeding, [^{99m}Tc]sulfur colloid. We were not evaluating the efficacy of other radiopharmaceuticals for the detection of GI bleeding.

Almost any intravenously injected radiopharmaceutical can potentially be used to detect GI bleeding. Technetium-99m diethylenetriaminepentaacetic acid (DTPA) has characteristics intermediate between sulfur colloid and labeled red cells. Technetium-99m sulfur colloid is cleared from the circulation with a half-time of 2.5–3.5 min (*2*). Technetium-99m DTPA plasma disappearance can be divided into three components with half-times of ~10, 90, and 600 min. Approximately 5% of DTPA binds to plasma proteins (*3*). Technetium-99m-labeled red cells, on the other hand, have a $T_{½}$ of ~29 hr (*4*).

There are a number of theoretic problems with the use of [^{99m}Tc]DTPA for GI bleeding. First, patients with poor renal function will have a slower clearance, causing higher background activity. This includes older patients (the group more likely to bleed), those with pre-renal azotemia/ATN from hypovolemia secondary to bleeding, and those with intrinsic renal disease. Background activity is a significant problem with [^{99m}Tc]DTPA bleeding studies. Owunwanne and coworkers state, "... the amount of activity at the bleeding site is usually slightly above the level of background activity..." (*5*). These authors recommend a type of background subtraction to help overcome these problems.

Second, intermittent GI bleeders can be missed with DTPA. In a clinical comparison of [^{99m}Tc]sulfur colloid to ^{99m}Tc-labeled red cells, the sensitivity of sulfur colloid was only 12% compared with 93% for ^{99m}Tc-labeled red cells (*6*). One of the explanations for these differences was the problem of intermittent GI bleeding. Technetium-99m sulfur colloid, being cleared more rapidly than red cells, did not detect more intermittent GI bleeds. McKusick et al. found that delayed imaging over 4 hr was necessary to detect GI bleeding in 50% of patients (*7*). Finally, [^{99m}Tc]DTPA activity in the kidneys, ureter, and especially the bladder, may obscure abnormal activity within the gastrointestinal tract.

We disagree with the statement that ^{99m}Tc-labeled red cells are not useful in detecting upper gastrointestinal bleeding. A number of studies have found that labeled red cells were able to detect upper GI bleeding (*6–11*). For example, McKusick