

Can ^{99m}Tc -labeled RBC-equilibrium radionuclide angiocardigraphy be an adjunct imaging biomarker for marrow hyperplasia in beta-thalassemia major patients?

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INTRODUCTION

Beta-thalassemia major (TM) is a hereditary disorder characterized by ineffective erythropoiesis owing to anomalies in beta-chain of hemoglobin and the peripheral anemia results in ineffective expansion and hyperplasia of the bone marrow.¹ These patients require multiple tests to monitor the adequacy of blood transfusion and iron overload.² ^{99m}Tc -labeled red blood cell-equilibrium radionuclide angiocardigraphy (^{99m}Tc RBC-ERNA) in these patients is used for monitoring of left ventricular ejection function (LVEF), along with prospect for whole-body marrow imaging as an indicator for adequacy of transfusion.

CASE SUMMARY

Twenty-two year TM woman with history of irregular blood transfusions since her early childhood presented with anemia and weakness. She had low hemoglobin (8.0 g/dl), reticulocytes in peripheral smear and increased RBC distribution width suggestive of inadequate transfusion. On evaluation, ^{99m}Tc RBC-ERNA (in vivo-labeling) followed by planar whole-body imaging, showed normal LVEF and increased marrow tracer uptake (Fig. 1A–C).

Patient was put on regular blood transfusions and chelation therapy. The follow-up ^{99m}Tc RBC-ERNA along with whole-body planar imaging after two years of regular treatment, revealed normal LVEF, and decrease in marrow uptake on visual and quantitative interpretation (Fig. 2A–C). Her present hemoglobin (9.6 g/dl) with only 0.01% reticulocytes and without nucleated RBCs indicate reversal of generalized marrow hyperplasia.

DISCUSSION

^{99m}Tc -sulfur colloid for long and recently ^{18}F -fluorothymidine PET/CT are in use for marrow imaging. However, demonstration of marrow hyperplasia is feasible with ^{99m}Tc RBC-ERNA study without any additional cost or radiation dose to patients.³ The index case shows usefulness of ^{99m}Tc RBC-ERNA study in

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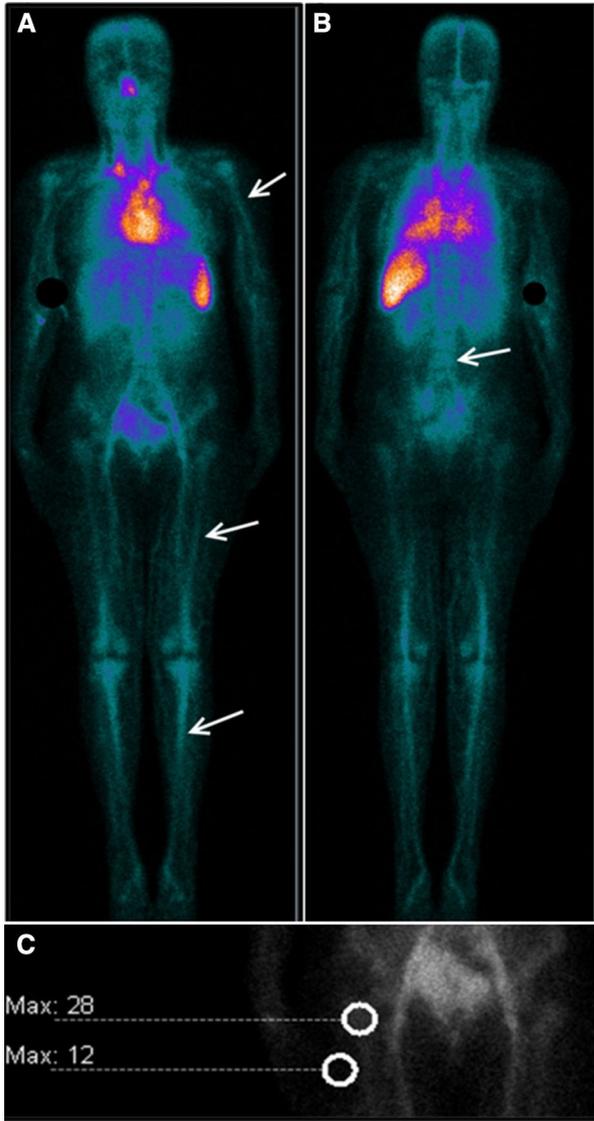


Figure 1. ^{99m}Tc RBC-ERNA whole-body anterior (A) and posterior (B) images showing increased tracer uptake in the bone marrow (arrows). The ratio of tracer uptake in marrow to soft tissue calculated by drawing circular region of interest over the inter-trochanteric region of right femur and the adjoining soft tissue (C) was 2.33 (28/12) reflecting increased marrow uptake.

monitoring the extent of marrow hyperplasia which might be non-invasive indirect evidence for adequacy of blood transfusion and extent of marrow uptake was correlating with the degree of peripheral anemia. ^{99m}Tc RBC-ERNA study may have the potential of low cost adjunct imaging biomarker for marrow hyperplasia in addition to routine use to assess LVEF.

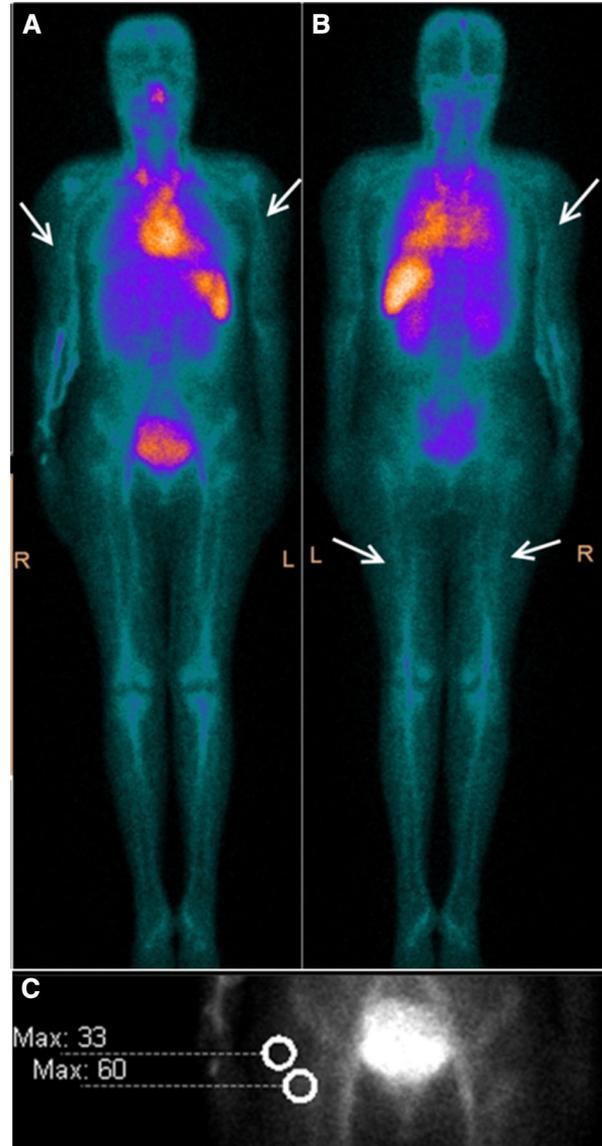


Figure 2. ^{99m}Tc RBC-ERNA study whole-body anterior (A) and posterior (B) images showing significant decrease of tracer uptake in bone marrow in the shaft of humeri (arrows) and in the shafts of femora. The ratio of marrow uptake in the inter-trochanteric region of right femur to soft tissue also decreased from 2.3 to 1.8 (C).

Disclosure

The authors declared that they have no competing interest.

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