

## **Abnormal Biodistribution of $^{99m}\text{Tc}$ Red Blood Cell Labeled Multi-Gated Acquisition Scan in the Presence of Suspected Cold Agglutinin Disease**

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## **ABSTRACT:**

$^{99m}\text{Tc}$  -red blood cells (RBCs) labeled multi-gated acquisition (MUGA) scan is a procedure in which the patient's red blood cells (RBCs) are radiolabeled and electrocardiograph-gated cardiac scintigraphy is obtained to assess the heart's pumping efficiency. Cold agglutinin disease (CAD), or cold antibody autoimmune hemolytic anemia, is a rare form of autoimmune hemolytic anemia in which the body's immune system attacks and destroys its own red blood cells. This case addresses an altered biodistribution pattern of radiolabeled RBCs in the presence of suspected cold agglutinin disease observed during a MUGA scan.

## **INTRODUCTION:**

It is not uncommon for lymphoma patients to present with autoimmune hemolytic anemia (AIHA). While AIHA is most commonly associated with warm autoantibodies it has also been reported less frequently from CAD and there are even fewer reports on diffuse large B cell lymphoma (DLBCL) presenting as cold agglutinin disease. In CAD, antibodies bind to the RBC membrane resulting in erythrocyte hemolysis. Naturally, these damaged RBCs will be preferentially sequestered by the spleen. As a result, elevated cold agglutinin titers may cause altered  $^{99m}\text{Tc}$  RBC biodistribution pattern resulting in a non-diagnostic MUGA study. This is a rarely reported event and not well known throughout the molecular imaging community. The imaging finding of this suspected unusual occurrence is reviewed in this presentation.

## **CASE REPORT:**

A 53 year-old man, with history of diffuse large B-cell lymphoma (DLBCL), post (4 year) autologous stem cell transplant (ASCT) evaluation, was referred for an annual <sup>99m</sup>Tc MUGA evaluation. The patient had 6 other previous MUGA studies dating from July 2012 to December 2015 with ejection fractions ranging from a high of 53% to a low of 39%. Previous studies revealed no unusual or abnormal <sup>99m</sup>Tc -RBC radiopharmaceutical biodistribution or altered physiological uptake. However, the patient's most recent MUGA exam was deemed uninterpretable due to poor cardiac blood pool localization. The test was repeated the following day with same uninterpretable results. While there was a negligible amount of blood pool activity, there was an overwhelming amount of activity concentrated within the liver and spleen (Fig 1) consistent with reticuloendothelial system uptake of colloid. Medication reconciliation demonstrated no identifiable causative interaction and no previous nuclear medicine studies had been performed. The in vitro Ultratag (Mallinckrodt, St. Louis, MO) red blood cell (RBC) labeling kit was prepared per manufacturer's guidelines and radiopharmaceutical quality control was acceptable (99%). Current laboratory studies were remarkable for slightly elevated Anion Gap (19 mmol/L) and TBILI (1.4 mg/dl), slightly decreased PLT CNT (155 K/UL), and highly elevated HSV 1 IGG TS (26.70). A thorough literature search revealed no explanation for this anomaly, with the exception of a SlideShare® presentation which presented a similar MUGA <sup>99m</sup>Tc -RBC distribution pattern in a patient who had cold agglutinin disease (CAD) (1). The most recent screening and detection of CAD that was noted in the available lab reports was on June 13, 2012.

## **DISCUSSION:**

Cold agglutinin disease is a rare autoimmune disorder in which autoantibodies produced by a person's immune system mistakenly target and destroy RBCs, causing hemolytic anemia.

Primary CAD is a well-recognized complication of lymphoproliferative disorders with lymphoplasmacytic lymphoma being the most common subtype of malignant lymphoma while DLBCL is less well associated. CAD may also be secondary due to infections such as HIV. While there are some well-known explanations for  $^{99m}\text{Tc}$ -RBC radiopharmaceutical biodistribution alterations (2), there are no reports in the literature which directly links abnormal  $^{99m}\text{Tc}$ -RBC distribution to CAD. However, based on a similar reported incidence as noted in reference (1), we suspect CAD as the likely culprit in this undiagnostic MUGA scan.

#### **CONCLUSION:**

MUGA cardiac assessments are commonly performed for anthracycline-based chemotherapy patients with a history of DLBCL. While there are some well recognized explanations for altered  $^{99m}\text{Tc}$  -RBC radiopharmaceutical biodistribution, there are other cases which cannot be as easily explained. Presence of CAD should be investigated in these patients whenever an unexpected biodistribution pattern is observed.

#### **DISCLOSURE:**

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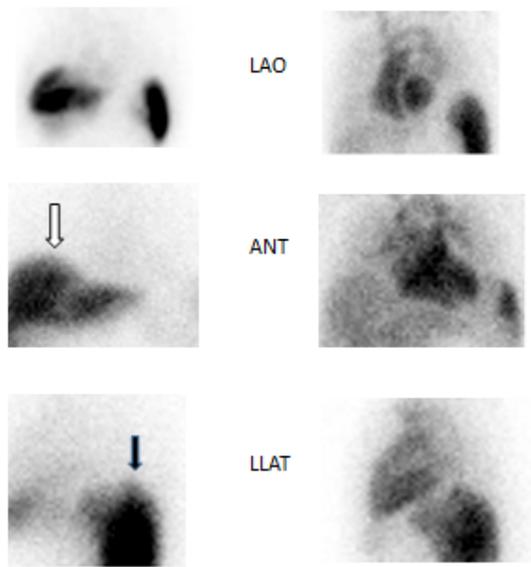


FIGURE 1

Multigated Acquisition (MUGA) images obtained demonstrating altered biodistribution (left) and normal biodistribution of standard blood pool (right) from three planes (Left anterior oblique, anterior, and left lateral). These images were acquired from the same patient at two different time points. The altered biodistribution demonstrates prominent activity within the liver (open arrow) and spleen (black arrow), with lack of the standard blood pool activity demonstrated normally.

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