

bone marrow was unremarkable. Abdominal imaging revealed splenomegaly measuring 15.6 cm. A diagnostic splenectomy was performed leading to transient improvement of ANC to $1.46 \times 10^3/\mu\text{L}$, with relapse within four months. Two short courses of G-CSF were attempted, but discontinued due to diffuse musculoskeletal pain and systemic flu-like symptoms; no blood samples were obtained during therapy, preventing assessment of hematologic response. Anti-HNA assays performed at UNIFESP identified anti-HNA-1b antibodies through granulocyte immunofluorescence (GIFT) and agglutination (GAT) tests. HNA genotyping confirmed the antibody targeted a self-antigen, establishing the diagnosis of primary autoimmune neutropenia. High-dose prednisone (1 mg/kg/day) led to hematological response (ANC $1.02 \times 10^3/\mu\text{L}$), but neutropenia recurred after tapering. Despite persistent severe neutropenia, the patient remains asymptomatic, off-treatment, and without infectious complications to date. **Conclusion:** Primary autoimmune neutropenia in adults is a rare and underdiagnosed condition that requires high clinical suspicion and access to specialized laboratory testing for anti-HNA antibodies. Responses to splenectomy, G-CSF, and corticosteroids are often incomplete or transient. Management should be individualized, balancing the severity of neutropenia with clinical symptoms and infection risk. As this case illustrates, profound neutropenia does not always correlate with clinical infections, and observation may be appropriate in asymptomatic patients. This case underscores the need for targeted diagnostics and tailored therapeutic strategies in adult AIN.

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RADIOLABELED HEMATOLOGICAL AND IMMUNE CELLS IN DIAGNOSTIC IMAGING: A QUANTITATIVE ANALYSIS IN THE LITERATURE

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Introduction: Radiolabeling of hematologic and immune cells has revolutionized diagnostic imaging in recent decades, enabling the precise tracking of infectious, inflammatory, autoimmune, and neoplastic processes. With advances in radioisotope production and imaging equipment, nuclear

hematology has assumed a central role in nuclear medicine, opening new frontiers for personalized diagnosis and treatment. **Objectives:** To quantitatively evaluate the number of publications reporting the use of radioisotopes in labeling some hematological and immune cells. **Material and methods:** A quantitative analysis of the literature was performed based on the PubMed/Medline database, covering the period from 2015 to 2025, for full papers. The search was conducted by combining descriptors related to the main cell types (such as erythrocytes, leukocytes, macrophages, monocytes, stem cells, and T cells) with the most commonly used radioisotopes (technetium-99m, copper-64, fluorine-18, gallium-68, and zirconium-89). **Discussion and conclusion:** The analysis yielded 1,096 articles. The results show a distinct distribution among the radioisotopes used: technetium-99m (Tc-99m) leads with 46% of publications, followed by fluorine-18 (F-18) with 24%, zirconium-89 (Zr-89) with 16%, gallium-68 (Ga-68) with 9%, and copper-64 (Cu-64) with 6%. When analyzing cell types, leukocytes appear in 25% of publications, macrophages in 21%, stem cells in 18%, erythrocytes in 14%, T cells in 14%, mesenchymal stem cells in 5%, monocytes in 3%, and dendritic cells in 1%. While Tc-99m predominates in most studies, Zr-89 was preferred for T-cell research, with 55 citations compared to only 23 for Tc-99m. The physicochemical characteristics of radioisotopes provide advantages and disadvantages for different types of studies, particularly their half-lives: Ga-68 (68 minutes), F-18 (110 minutes), Tc-99m (6 hours), Cu-64 (12.7 hours), and Zr-89 (3.3 days). The longer half-life of Zr-89 makes it ideal for studies requiring prolonged follow-up, such as monitoring CAR-T cells in immunotherapies. Factors such as cost and availability also significantly influence the choice of radioisotopes, making Tc-99m the radioisotope of choice, since it is the most readily available. From a cellular perspective, radiolabeled leukocytes determine the location of infectious processes, differentiating them from sterile inflammation; labeled macrophages have been used to track inflammation sites in autoimmune diseases such as multiple sclerosis; radiolabeled red blood cells locate hemorrhagic foci; radiolabeled stem cells have been used to assess cell migration, differentiation, and integration in different tissues; and radiolabeled T cells are essential for assessing the distribution of these cells after reinjection into patients. Despite the technical challenges inherent in integrating two complex techniques—the manipulation of blood elements and the use of radioisotopes—cellular radiolabeling has established itself as an indispensable tool for both precise clinical management and the development of new therapies. These findings reinforce the need for continued investment in the development of innovative radiopharmaceuticals and the optimization of imaging techniques, aiming to expand the potential of this area of modern medicine.

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