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Essential Guidelines for Lymphoma Imaging

Imaging plays a critical role in managing lymphoma, a diverse group of malignancies affecting the lymphatic system. It assists in the detection, staging and assessment of treatment response, enabling clinicians to make informed decisions about patient care. The European Society of Oncologic Imaging (ESOI) has developed a set of practice recommendations to ensure the effective and consistent use of imaging techniques across various lymphoma subtypes. These guidelines emphasise the use of [18F]FDG PET/CT and contrast-enhanced CT, adapted to the metabolic behaviour and clinical presentation of each lymphoma type.

Imaging Techniques and Recommendations
The ESOI recommends [18F]FDG PET/CT as the preferred imaging technique for most lymphoma subtypes due to its ability to detect hypermetabolic activity associated with malignant cells. It plays a vital role in both the initial staging and monitoring of treatment response. Hodgkin lymphoma and aggressive non-Hodgkin lymphomas (NHL), such as diffuse large B-cell lymphoma (DLBCL), commonly exhibit high FDG uptake, making PET/CT the optimal choice.

For indolent lymphomas like follicular lymphoma, PET/CT is also recommended for initial staging and treatment response assessment. However, certain indolent lymphomas, such as marginal zone lymphoma, show variable FDG uptake, making contrast-enhanced CT a viable alternative, especially when baseline FDG avidity is low. In contrast, small lymphocytic lymphoma and chronic lymphocytic leukaemia (SLL/CLL) generally require only contrast-enhanced CT for baseline assessment and monitoring unless transformation to a higher-grade lymphoma is suspected.

While PET/CT is preferred for most lymphomas, standard CT remains a primary option when PET/CT is unavailable or not indicated. MRI is generally reserved for specific cases, such as central nervous system lymphoma, and may be useful as a secondary tool for clarifying bone marrow involvement when PET/CT results are inconclusive. PET/MRI is an emerging modality that has shown promising results but is not yet widely adopted in clinical practice due to limited availability.

Staging and Assessment Criteria
Lymphoma staging is essential for treatment planning and determining prognosis. The ESOI guidelines recommend the Ann Arbor and Lugano staging systems, which classify lymphoma into four stages based on the extent of nodal and extranodal involvement.

Stage I involves a single nodal region or a solitary extranodal lesion, while Stage II is characterised by multiple nodal regions on the same side of the diaphragm. Stage III indicates nodal involvement on both sides of the diaphragm, and Stage IV involves extensive extranodal spread, such as bone marrow infiltration or multiple organ lesions.

In most FDG-avid lymphomas, PET/CT provides sufficient information for staging. However, in cases of SLL/CLL and certain indolent lymphomas with low FDG uptake, a bone marrow biopsy may still be required to confirm the extent of disease involvement. The ESOI guidelines also advise against using the terms "primary tumour" and "metastases" for lymphoma, instead recommending terms such as "nodal manifestations" and "extranodal manifestations" due to the systemic nature of the disease.

The 5-point Deauville score is recommended for treatment response assessment in all FDG-avid lymphomas. This scoring system compares post-treatment FDG uptake in lesions with the liver and blood pool uptake. Scores of 1 to 3 generally indicate complete metabolic response (CMR), while scores above 3 suggest residual disease. In non-FDG-avid lymphomas, contrast-enhanced CT is used to measure lesion size changes, with complete response indicated by the resolution of extranodal lesions and lymph nodes shrinking to a long-axis diameter of 1.5 cm or less.

Challenges and Evolving Trends
Interpreting lymphoma imaging presents unique challenges due to the systemic nature and variable metabolic activity of the disease. Unlike solid tumours, lymphoma often involves multiple nodal regions and can exhibit diffuse lymphadenopathy without a single dominant mass. This complexity makes it difficult to differentiate between residual disease and reactive lymphadenopathy, especially in cases of indolent lymphoma where FDG uptake is lower or absent.

The ESOI guidelines caution against over-reliance on FDG uptake alone and recommend correlation with anatomical imaging and clinical data to avoid false-positive findings due to inflammation or infection. The presence of residual FDG uptake must be interpreted alongside lesion size, morphology and patient history.

Emerging trends in lymphoma imaging aim to address these challenges with new PET tracers targeting specific receptors, such as CXCR4, which have shown potential in non-FDG-avid subtypes like marginal zone lymphoma and small lymphocytic lymphoma. Additionally, quantitative PET metrics such as metabolic tumour volume (MTV) and standardised uptake values (SUVmax) are gaining attention for their prognostic value, potentially complementing or even replacing the Deauville score in the future.

Artificial intelligence and deep learning models are also being explored to assist with automated lesion detection and segmentation, improving the accuracy and consistency of lymphoma assessment. These technologies could further standardise image interpretation and enhance early detection of treatment failure.

The ESOI guidelines provide a comprehensive and standardised approach to lymphoma imaging, ensuring that the choice of imaging modality aligns with the biological behaviour of each lymphoma subtype. PET/CT remains the preferred method for staging and treatment response assessment in FDG-avid lymphomas, while CT and MRI retain roles in specific low-FDG-avid cases and central nervous system involvement. Adhering to these guidelines enhances diagnostic accuracy, facilitates consistent staging and enables more precise treatment monitoring.

Source: **European Radiology**

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