Redefining MRI:
From Image to Insight

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Breast 1

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Interpreting Post-NAC Breast MRI: Mastering Response Assessment and Avoiding Pitfalls

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Background:
The breast cancer neoadjuvant chemotherapy (NAC) paradigm has shifted from downstaging large tumors to enabling surgical de-escalation, including breast-conserving surgery and omitting axillary lymph node dissection. Consequently, radiologists must act as active surgical navigators rather than passive diagnostic readers. This lecture provides a comprehensive framework for assessing therapeutic response using post-NAC breast MRI, matching imaging features with molecular subtypes, and avoiding critical pitfalls during surgical planning.

Response Assessment & Molecular Subtypes:
Post-NAC tumor beds are highly heterogeneous, mixing viable tumor cells, fibrosis, necrosis, inflammation, and edema—frequently causing false-positive or false-negative results. Furthermore, tumor shrinkage patterns vary dramatically by molecular subtype: triple-negative and HER2-positive cancers typically exhibit favorable concentric shrinkage, whereas hormone receptor-positive tumors often show fragmented shrinkage or scattered residual disease. While MRI delineates tumor bed size and kinetic alterations, it cannot directly quantify tumor cellularity or microscopic clusters, meaning it correlates with but cannot replace the pathological Residual Cancer Burden (RCB) index.

MRI as a Surgical Roadmap:
To safely guide surgical de-escalation, post-NAC MRI must serve as a meticulous roadmap rather than a mere detector of pathological complete response (pCR). When evaluating candidates for BCS, radiologists must systematically report: (1) precise residual disease extent, (2) multifocality/multicentricity, (3) correlation with residual microcalcifications, (4) biopsy clip localization, (5) axillary response status, and (6) distance to structural landmarks or tumor-to-breast ratio.

Avoiding Crucial Pitfalls & Conclusion:
Surgical downsizing introduces key diagnostic hazards. Critical pitfalls include overlooking residual DCIS presenting as radiological complete response (rCR), misinterpreting residual non-mass enhancement (NME) as benign fibrosis, and ignoring baseline multicentricity. Additionally, because breast pCR does not guarantee axillary pCR, independent nodal evaluation remains imperative. Mastering these subtype-specific patterns and diagnostic traps allows radiologists to provide precise anatomical guidance, optimizing both oncological safety and patient quality of life.

Keywords: *Response assessment, Surgical de-escalation, Diagnostic pitfalls*