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Precision Imaging: MRI's Critical Role in Early MCI AD Diagnosis

Announcer:
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Dr. Sabbagh:
This is CME on ReachMD and I'm Dr. Marwan Noel Sabbagh. Today we're going to discuss MRI's critical role in early Alzheimer's disease and mild cognitive impairment diagnosis. Historically, we have actually used MRI to exclude other major pathology, but we need to revisit that approach. So, this has been the way we've gone about it before, where if they had stroke, tumor, or normal pressure hydrocephalus, that's basically the extent by which we ended our evaluation by excluding major pathology. A good example for example is normal pressure hydrocephalus. I will admit to you this actually right off the internet. This is a good, egregious example of a patient with pretty severe normal pressure hydrocephalus on the left, compared to a normal image on the right.

This patient probably has the triad of incontinence, magnetic gait, and dementia. And so, the obvious approach is to do structural imaging to exclude major pathology. The reason this is important is that we would also look for white matter disease, stroke, and other things. So, we are now starting to change the way we approach the use of MRIs. So, excluding major pathologies is one thing, but now we want to quantify white matter disease. So, if they have severe white matter disease, as you see on the right-hand side of the slide, that suggests there's extensive white matter rarefaction, which would suggest that there is increased risk for vascular pathology. So, the rule of thumb, and it's very important you as the audience understand this, is that a little white matter disease, as is on the left-hand side of the slide, is an age-related finding, it is not vascular dementia. On the right-hand side of the slide, if it has significant or broad amount of white matter pathology, the rule of thumb is greater than 50 cc of white matter rarefaction, a phenomenon known as leukoaraiosis, we would say that there is an extensive white matter disease, and we would say there's the possibility that vascular pathology is contributing to the cognitive decline. So, I'm saying to you that one of the changes we're seeing, is not just to exclude major pathologies such as stroke, but to quantify the amount of white matter rarefaction, because if it's a lot of white matter rarefaction, you might have vascular dementia, or a contribution of white matter rarefaction to the dementia.

The third thing you need to think about is really thinking about volumetric approaches. So, what we understand is, that if you have a patient with, on the left-hand side, you see the red arrows, pointing to the medial temporal lobe on a T1-weighted imaging, and you see there is atrophy of the medial temporal lobe.

This is super important because that suggests that there is neurodegeneration. So, a proxy marker of neurodegeneration is hippocampal atrophy or medial temporal lobe atrophy, and below the 5th percentile on the hippocampus we can predict two things. Number one, it increased risk for progression for mild cognitive impairment to dementia and number two, is a proxy marker of perhaps, not just neurodegeneration, but of Alzheimer pathology. So, it has good sensitivity, but it does not have good specificity. And why do I say that? Is that in some cases, patients have classic amnestic Alzheimer's disease pathology, that's demonstrated by CSF or PET, but they have not atrophied or degenerated their brain to the point of having the medial temporal lobe in the 5th percentile. So, I'm saying it's a good marker, but if you don't see it, it does not exclude it, as well.

There are ways to identify this and measure this. There is volumetric software. One brand is called NeuroQuant and what it does is it uses referential atlases to measure each part of the brain, and we would look at the medial temporal lobe volumetrically, and if it's below the 5th percentiles, it can be measured. So, that would be a proxy marker.

The other thing we would use MRI for is to monitor for ARIA, amyloid related imaging abnormality. This is post approval of a monoclonal antibody, and if you have either ARIA-E, which is vasogenic edema on the left-hand side of the slide or ARIA-H, which is microhemorrhages on the right-hand side of the slide, that would be a marker of a pathology response, or a pathological change to the presence of monoclonal antibodies. So, my point is that we would use MRIs not just to exclude other pathologies, but to do for surveillance around cerebral amyloid angiopathy. And so, what I say to you is that MRI, approach of MRI is changing. We need to use it to exclude major pathology, but also to look for white matter scoring, volumetric, and for surveillance of the monoclonal antibodies.

Thank you for listening.

Announcer:
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